INSTALLATION MANUAL FOR SEA TEL 4012 GX KU-BAND BROADBAND-AT-SEA VSAT ANTENNA SYSTEM

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Sea Tel Inc is also doing business as Cobham Antenna Systems

May 4, 2012 Document. No. 136878 Revision A

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Sea Tel Marine Stabilized Antenna systems are manufactured in the United States of America.

Sea Tel is an ISO 9001:2008 registered company.

Certificate Number 13690 issued March 14, 2011.

R&TTE

CE

The 4012GX Maritime Satellite Earth Station complies with the requirements of directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on Radio equipment and Telecommunication Terminal Equipment. A copy of the R&TTE Declaration of Conformity for this equipment is contained in this manual.

The Sea Tel 4012GX 1.0 Meter antennas will meet the off-axis EIRP spectral density envelope set forth in FCC 47 C.F.R. § 25.222(a)(1)(i) when the input power density limitations, listed in our FCC Declaration, are met..

These antenna systems also contain FCC compliant supervisory software to continuously monitor the pedestal pointing accuracy and use it to control the “Transmit Mute” function of the satellite modem to satisfy the provisions of FCC 47 C.F.R. § 25.222(a)(l)(iii).

Revision History

REV	ECO#	Date	Description	By
X1		March 7, 2012	PRELIMINARY Release.	MDN
A		May 4, 2012	Production Release	MDN

Sea Tel
COBHAM

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Declaration of Potentially Hazardous Materials onboard for the Green Passport Requirement

(Based on Annex 2 to the Industry Code of Practice on Ship Recycling, August 2001.*)

This inventory is part of the ship's Green Passport and provides information with regard to materials known to be potentially hazardous and utilized in the construction of the ship, its equipment and systems. It may be supplemented, as appropriate, with technical information in respect of certain categories of potentially hazardous materials listed in this document, particularly with regard to their proper removal and handling.

The Equipments Maker / Supplier have to declare if his equipment / equipments contain any of the hazardous material listed below with concentration and duly signed and stamped.

Vessel Name/Hull Number/Shipyard:

Equipment Details: All Sea Tel manufactured antenna systems.

Supplier Details:

Sea Tel, Inc
4030 Nelson Ave
Concord, CA. 94520
Tel: +01 925 798 7979

PART 1 – POTENTIALLY HAZARDOUS MATERIALS IN THE SHIP STRUCTURE AND EQUIPMENT

1A. ASBESTOS

Type of Asbestos Materials in System/Equipment/Component	Approximate quantity/volume
N/A	0

1B. Paint with – Additives (Lead, Tin, Cadmium, Organotins (TBTs), Arsenic, Zinc, Chromium, Strontium, Other)

Type of Additives	Materials containing additives	Location (If Applicable)	Approximate Quantity
N/A	N/A	N/A	0

1C.Plastic Materials

Type	Components containing plastic materials	Location (If Applicable)	Approximate quantity/volume
N/A	N/A	N/A	0

1D. Materials containing PCBs, PCTs, PBBs at levels of 50mg/kg or more

Type PCBs/PCTs/PBBs	Components containing such materials	Location (If Applicable)	Approximate quantity/volume
N/A	**N/A**	**N/A**	**0**

1E. Gases sealed in the equipment or machinery of supplied system

Type	Equipment/Component containing such gases	Location (If Applicable)	Approximate quantity/volume
Refrigerants (R12/R22)	N/A	N/A	**0**
HALON	N/A	N/A	**0**
CO^2	N/A	N/A	**0**
Acetylene	N/A	N/A	**0**
Propane	N/A	N/A	**0**
Butane	N/A	N/A	**0**
Oxygen	N/A	N/A	**0**
Other (Specify)	N/A	N/A	**0**

1F. Chemicals in the equipment or machinery of supplied system

Type of chemicals	Equipment/Component containing such chemicals	Location (If Applicable)	Approximate quantity/volume
Anti-seize Compounds	N/A	N/A	**0**
Engine Additives	N/A	N/A	**0**
Antifreeze Fluids	N/A	N/A	**0**
Kerosene	N/A	N/A	**0**
White Spirit	N/A	N/A	**0**
Boiler/Water Treatment	N/A	N/A	**0**
De-ioniser Regenerating	N/A	N/A	**0**
Evaporator Dosing and	N/A	N/A	**0**
Descaling Acids	N/A	N/A	**0**
Paint/Rust Stabilisers	N/A	N/A	**0**
Solvents/Thinners	N/A	N/A	**0**
Chemical Refrigerants	N/A	N/A	**0**
Battery Electrolyte	N/A	N/A	**0**
Hotel Service Cleaners	N/A	N/A	**0**
Other (Specify)	N/A	N/A	**0**

1G. Other Substances inherent in the machinery, equipment or fittings of supplied system

Type	Equipments/Components contain such materials	Location (If Applicable)	Approximate quantity/volume
Lubricating Oil	N/A	N/A	**0**
Hydraulic Oil	N/A	N/A	**0**
Lead Acid Batteries	N/A	N/A	**0**
Alcohol	N/A	N/A	**0**
Methylated Spirits	N/A	N/A	**0**
Epoxy Resins	N/A	N/A	**0**
Mercury	N/A	N/A	**0**
Radioactive Materials	N/A	N/A	**0**
Other (Specify)	N/A	N/A	**0**

All of the plastics used on Sea Tel antenna systems are completely inert and pose no harm when in use or when scrapped.

All of the lubricating oils used on Sea Tel antenna systems are completely inert and pose no harm when in use or when scrapped.

All of the anti seize compounds used on Sea Tel antenna systems are completely inert and pose no harm when in use or when scrapped.

We hereby declare that the above inventory of potentially hazardous material truly correspond to the equipment / equipments supplied to ship.

______________________________ Oct 06, 2011

John Phillips Date

VP Engineering
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R&TTE Declaration of Conformity

Sea Tel Inc. declares under our sole responsibility that the products identified below are in compliance with the requirements of:

DIRECTIVE 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on Radio equipment and Telecommunication Terminal Equipment and the mutual recognition of their conformity.

Product Names: **4012GX Ku Band Tx/Rx Maritime Satellite Earth Stations.**

These products have been assessed to Conformity Procedures, Annex IV, of the above Directive by application of the following standards:

EMC:

EMC standard for Radio Equipment (Maritime)	**ETSI EN 301 843-1 V1.4.1 (2004-06)**
EMC standard for Radio Equipment (Common)	**ETSI EN 301 489-1 V1.4.1 (2002-08)**
EMC standard for Radio Equipment (General)	**ETSI EN 300 339 (1998-03)**
Marine Navigational and Radio Communication Equipment and Systems – General Requirements:	**IEC EN 60945:1997**

Satellite Earth Stations and System (SES):

Harmonized EN for Very Small Aperture Terminals (VSAT):	**ETSI EN 301 428-1 V1.3.1 (2006-02)**
Harmonized EN for satellite Earth Stations on board Vessels (ESVs)	**ETSI EN 302 340 V1.1.1 (2006-04)**

Safety:

Safety of Information Technology Equipment:	**IEC EN 60950-1:2001 (1st Edition)**

Certificates of Assessment were completed by and are on file at BACL Labs, Santa Clara, CA.

Peter Blaney, Chief Engineer
Sea Tel, Inc
Concord, CA

Doc Number 137201 Revision A
13 April 2012

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FCC Declaration of Conformity

1. Sea Tel, Inc. designs, develops, manufactures and services marine stabilized antenna systems for satellite communication at sea. These products are in turn used by our customers as part of their Ku-band Earth Station on Vessels (ESV) networks.

2. FCC regulation 47 C.F.R. § 25.222 defines the provisions for blanket licensing of ESV antennas operating in the Ku Band. This declaration covers the requirements for meeting § 25.222 (a)(1) by the demonstrations outlined in paragraphs (b)(1)(i) and (b)(1)(iii). The requirements for meeting § 25.222 (a)(3)-(a)(7) are left to the applicant. The paragraph numbers in this declaration refer to the 2009 version of FCC 47 C.F.R. § 25.222.

3. Sea Tel hereby declares that the antennas listed below will meet the off-axis EIRP spectral density requirements of § 25.222 (a)(1)(i) with an N value of 1, when the following Input Power spectral density limitations are met:

*0.6 Meter Ku Band, Models 2406 and USAT-24 are limited to	-21.6 dBW/4kHz
*0.75 Meter Ku Band, Models 3011 and USAT-30 are limited to	-21.6 dBW/4kHz
1.0 Meter Ku Band, Models 4003/4006/4009/4010 are limited to	-16.3 dBW/4kHz
1.0 Meter Ku Band Model 4012 is limited to	-16.6 dBW/4kHz
1.2 Meter Ku Band, Models 4996/5009/5010 are limited to	-14.0 dBW/4kHz
1.5 Meter Ku Band, Models 6006/6009 are limited to	-14.0 dBW/4kHz
2.4 Meter Ku Band, Models 9797 and 9711QOR are limited to	-14.0 dBW/4kHz

4. Sea Tel hereby declares that the antennas referenced in paragraph 3 above, will maintain a stabilization pointing accuracy of better than 0.2 degrees under specified ship motion conditions, thus meeting the requirements of § 25.222 (a)(1)(ii)(A). Those antennas marked with * will maintain a stabilization pointing accuracy of better than 0.3 degrees. The Input Power spectral density limits for these antenna have been adjusted to meet the requirements of§ 25.222 (a)(1)(ii)(B).

5. Sea Tel hereby declares that the antennas referenced in paragraph 3 above, will automatically cease transmission within 100 milliseconds if the pointing error should exceed 0.5 degrees and will not resume transmission until the error drops below 0.2 degrees, thus meeting the requirements of § 25.222 (a)(1)(iii).

6. Sea Tel maintains all relevant test data, which is available upon request, to verify these declarations.

Peter Blaney, Chief Engineer
Sea Tel, Inc
Concord, CA

Document Number 130445 Revision G
13-April-2012

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1. 4012 GX System Configuration(s)

The 4012 GX Stabilized Antenna system is to be used for Transmit/Receive (TX/RX) satellite communications, it is comprised of two major groups of equipment. These are the Above Decks Equipment (ADE) and the Below Decks Equipment (BDE). There will also be interconnecting cables between the ADE & BDE and cables to provide other inputs to the system.

It is initially equipped for Ku-Band operation, however, later it may be upgraded to Ka-Band if desired (when the Ka-Band services are available).

1.1. System Cables

AC Power & Coaxial cables will be discussed in a separate chapter.

1.2. Other Inputs to the System

Multi-conductor cables from Ships Gyro Compass, GPS, phone, fax and Computer equipment may also be connected in the system.

1.3. Simplified block diagram of a 4012 GX system

Your 4012 GX TXRX system consists of two major groups of equipment; an above-decks group and a below-decks group. Each group is comprised of, but is not limited to, the items listed below. All equipment comprising the Above Decks is incorporated inside the radome assembly and is integrated into a single operational entity. For inputs, this system requires only an unobstructed line-of-sight view to the satellite, Gyro Compass input and AC electrical power.

A. Above-Decks Equipment (all shown as the ADE) Group

- Stabilized antenna pedestal
- Antenna Reflector
- Feed Assembly with Cross-Pol and Co-Pol LNBs
- 8W Ku-Band Solid State Block Up-Converter (BUC)
- Radome Assembly

B. Below-Decks Equipment Group

- Media Xchange Point™ (MXP)
- Customer Furnished Equipment - Satellite Modem and other below decks equipment required for the desired communications purposes (including LAN and VOIP equipment).
- Appropriate Coax, Ethernet, and telephone cables

1.4. Dual Antenna Configuration

Sometimes, due to very large blockage conditions, you may need to install a dual antenna configuration to provide uninterrupted services. Two full antenna systems are installed and the ACU control outputs are connected to an arbitrator switch panel which then is connected to the below decks equipment. The connection scheme is required for MXP “A” to be able to control Antenna “A” (and ONLY Antenna “A”) AND MXP “B” to be able to control Antenna “B” (and ONLY Antenna “B”).

You will program the blockage zone(s) for each of the two antennas (refer to Setup – Blockage Zones). The blockage output from each MXP is fed to the arbitrator. The blockage output is a transistor “short” to ground when the antenna is within a programmed blockage zone and is an “open” when not blocked.

When one antenna is blocked, its blockage output will command the arbitrator panel to switch services to the modem from that antenna to the other antenna. The arbitrator panel provides a logic latch to prevent excess switching when the ship heading is yawing, therefore, causing if the antenna to be repeatedly blocked – unblocked – blocked.

1.5. Open Antenna-Modem Interface Protocol (OpenAMIP™) Specification:

1.5.1. Overview:

OpenAMIP™, an ASCII message based protocol invented and Trademarked by iDirect is a specification for the interchange of information between an antenna controller and a satellite modem. This protocol allows the satellite modem to command the MXP (via TCP port 2002) to seek a particular satellite as well as allowing exchange of information necessary to permit the modem to initiate and maintain communication via the antenna and the satellite. In general, OpenAMIP™ is not intended for any purpose except to permit a modem and the MXP to perform synchronized automatic beam switching when using an iDirect Network. It is ***NOT*** a status logging system or a diagnostic system. In addition, OpenAMIP™ is intended for a typical installation whereby a specific satellite modem and Antenna system are properly configured to work together. The protocol does not make specific provisions for auto-discovery or parameter negotiation. It is still the responsibility of the installer to ensure that the parameters of both the satellite modem (proper option files) and the MXP/PCU (setup parameters) are actually compatible for the intended satellite(s).

1.5.2. Interface requirements:

1.5.2.1. Hardware

Sea Tel Media Xchange Point (MXP)

Any Satellite modem manufacturer that is compatible with OpenAMIP™

CAT5 Patch cable

1.5.2.2. Software

Sea Tel MXP software version (latest).

1.5.3. Utilized OpenAMIP™ Commands:

1.5.3.1. Antenna Commands:

Command	Description	Example
S f1 f2 f3	Satellite Longitude, 3 parameters: Degrees E/W (-value equals West), Latitude Variance (Inclined Orbit), Sat Skew Offset	“S -20.1 1.0 3.5”
P c1 c2	Polarization, 2 parameters: H,V,L,, or R	“P L R”
H f1 f2	Tracking Frequency: 2 Parameters: Center Frequency and Bandwidth in MHz	“H 1100.500 0.256”
B f1 f2	Down Conversion Offset: 2 parameters: LNB (Receive) Local Oscillator and BUC (TX) L.O.	“B 10750”
F	Find, Target satellite using existing S, P,R, and H Parameters	
A i	Set keep alive in seconds (0 = off)	“A 5”
L b1 b2	Modem Lock and free to transmit. 2 parameters: b1 indicates Rx lock and b2 (not utilized) enables/disables Tx Mute to BUC	“L 1 1”
W i	GPS Update: Sets GPS Update period in seconds (0 = Off)	“W 300”
I s1 s2	Set modem vendor (s1) and device (s2) 2 parameters:	“I iDirect 5100”

1.5.3.2. Modem Commands:

Command	Description	Example
a i	Set keep alive in seconds (0 = off)	"a 5"
i s1 s2	Set Antenna Vendor (s1) and device (s2) 2 parameters:	"i Sea Tel DAC-2202"
s b1 b2	Antenna Status: 2 parameters: b1 is functional status and b2 is Tx allowed	"s 1 1"
w b1 f1 f2 t1	Set GPS Position: 4 parameters: b1 is validity flag, f1 is latitude, f2 is longitude, and t1 is timestamp	"w 1 38.222 122.123 0"

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2. Site Survey

The objective of the Site survey is to find the best place to mount the antenna & the below decks equipment, the length and routing of the cables and any other items or materials that are required to install the system and identify any other issues that must be resolved before or during the installation.

2.1. Site Selection Aboard The Ship

The radome assembly should be installed at a location aboard ship where:

- The antenna has a clear line-of-sight to view as much of the sky (horizon to zenith at all bearings) as is practical.
- X-Band (3cm) Navigational Radars:
    - The ADE should be mounted more than 0.6 meters/2 feet from 2kW (24 km) radars
    - The ADE should be mounted more than 2 meters/8 feet from 10kW (72 km) radars
    - The ADE should be mounted more than 4 meters/12 feet from 160kW (250km) radars
- S-Band (10cm) Navigational Radars:
    - If the ADE is/has C-Band it should be mounted more than 4 meters/12 feet from the S-band Radar.
- The ADE should not be mounted on the same plane as the ship's Radar, so that it is not directly in the Radar beam path.
- The ADE should be mounted more than 2.5 meters/8 feet from any high power MF/HF antennas (<400W).
- The ADE should be mounted more than 4 meters/12 feet from any high power MF/HF antennas (1000W).
- The ADE should also be mounted more than 4 meters/12 feet from any short range (VHF/UHF) antennae.
- The ADE should be mounted more than 2.5 meters/8 feet away from any L-band satellite antenna.
- The ADE should be mounted more than 3 meters/10 feet away from any magnetic compass installations.
- The ADE should be mounted more than 2.5 meters/8 feet away from any GPS receiver antennae.
- Another consideration for any satellite antenna mounting is multi-path signals (reflection of the satellite signal off of nearby surfaces arriving out of phase with the direct signal from the satellite) to the antenna. This is particularly a problem for the onboard GPS, and/or the GPS based Satellite Compass.
- The Above Decks Equipment (ADE) and the Below Decks Equipment (BDE) should be positioned as close to one another as possible. This is necessary to reduce the losses associated with long cable runs.
- This mounting platform must also be robust enough to withstand the forces exerted by full rated wind load on the radome.
- The mounting location is robust enough that it will not flex or sway in ships motion and be sufficiently well re-enforced to prevent flex and vibration forces from being exerted on the antenna and radome.
- If the radome is to be mounted on a raised pedestal, it ***MUST*** have adequate size, wall thickness and gussets to prevent flexing or swaying in ships motion. In simple terms it must be robust.

If these conditions cannot be entirely satisfied, the site selection will inevitably be a “best” compromise between the various considerations.

2.2. Antenna Shadowing (Blockage) and RF Interference

At the transmission frequencies of C and Ku band satellite antenna systems, any substantial structures in the way of the beam path will cause significant degradation of the signal. Care should be taken to locate the ADE so that the ADE has direct line-of-sight with the satellite without any structures in the beam path through the full 360 degree ships turn. Wire rope stays, lifelines, small diameter handrails and other accessories may pass through the beam path in limited numbers; however, even these relatively insignificant shadows can produce measurable signal loss at these frequencies.

2.3. *Mounting Foundation*

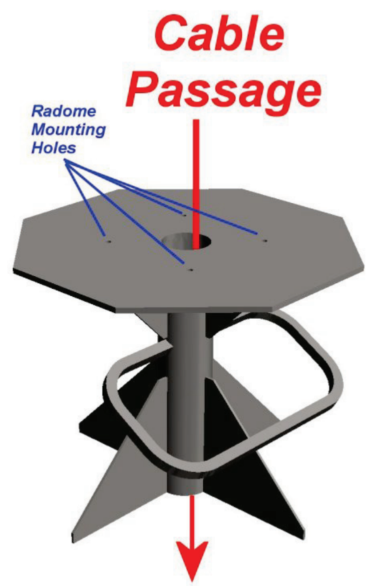
2.3.1. Mounting on Deck or Deckhouse

While mounting the ADE on a mast is a common solution to elevate the ADE far enough above the various obstructions which create signal blockages, sometimes the best mounting position is on a deck or deckhouse top. These installations are inherently stiffer than a mast installation, if for no other reason than the design of the deck/deckhouse structure is prescribed by the ship's classification society. In the deck/deckhouse design rules, the minimum plating and stiffener guidelines are chosen to preclude high local vibration amplitudes.

Most installations onto a deck or deckhouse structure will require a mounting pedestal to raise the ADE above the deck for radome hatch access and to allow the full range of elevation (see ADE mounting considerations above). Some care must be taken to ensure the mounting pedestal is properly aligned with the stiffeners under the deck plating.

2.3.2. ADE Mounting Considerations

Mounting the radome directly on the deck, or platform prevents access to the hatch in the base of the radome unless an opening is designed into the mounting surface to allow such entry. If there is no access to the hatch the only way to service the antenna is to remove the radome top. Two people are required to take the top off of the radome without cracking or losing control of it, but even with two people a gust of wind may cause them to lose control and the radome top may be catastrophically damaged (see repair information in the radome specifications).



If access to the hatch cannot be provided in the mounting surface, provide a short ADE support pedestal to mount the ADE on which is tall enough to allow access into the radome via the hatch.

Ladder rungs must be provided on all mounting stanchions greater than 3-4 feet tall to allow footing for personnel safety when entering the hatch of the radome.

The recommended cable passage in the 50, 60 and 66 inch radomes is through the bottom center of the radome base, down through the ADE support pedestal, through the deck and into the interior of the ship.

2.3.3. Sizing of the support pedestal

The following should be taken into account when choosing the height of a mounting support stand:

1. The height of the pedestal should be kept as short as possible, taking into account recommendations given in other Sea Tel Guidelines.
2. The minimum height of the pedestal above a flat deck or platform to allow access into the radome for maintenance should be 0.6 meters (24 inches).
3. The connection of the ADE mounting plate to the stanchion and the connection of the pedestal to the ship should be properly braced with triangular gussets (see graphic above). Care should be taken to align the pedestal gussets to the ship's stiffeners as much as possible. Doublers or other reinforcing plates should be considered to distribute the forces when under-deck stiffeners are inadequate.
4. The diameter of the pedestal stanchion shall not be smaller than 100 millimeters (4 inches). Where the ADE base diameter exceeds 1.5 meters (60 inches), additional stanchions (quantity greater than 3) should be placed rather than a single large stanchion.
5. Shear and bending should be taken into account in sizing the ADE mounting plate and associated gussets.
6. Shear and bending must be taken into account when sizing the pedestal to ship connection.
7. All welding should be full penetration welds –V-groove welds with additional fillet welds – with throats equivalent to the thickness of the thinnest base material.
8. For an ADE mounted greater than 0.6 meters (24 inches) above the ship's structure, at least one (1)

foot rung should be added. Additional rungs should be added for every 0.3 meter (12 inches) of pedestal height above the ship's structure.

9. For an ADE mounted greater than 3 meters (9 feet) above the ship's structure, a fully enclosing cage should be included in way of the access ladder, starting 2.3 meters (7 feet) above the ship's structure.

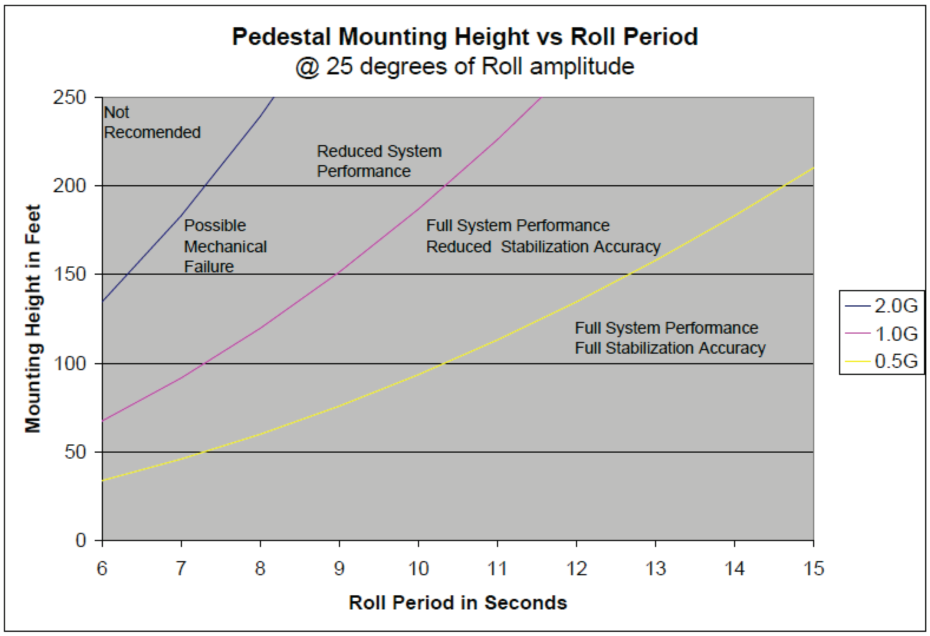
2.4. Mounting Height

The higher up you mount the antenna above the pivot point of the ship the higher the tangential acceleration (g-force) exerted on the antenna will be (see chart below).

When the g-force exerted on the antenna is light, antenna stabilization and overall performance will not be affected.

If the g-force exerted on the antenna is high enough (> 1 G), antenna stabilization and overall performance will be affected.

If the g-force exerted on the antenna is excessive (1-2 Gs), the antenna will not maintain stabilization and may even be physically damaged by the g-force.



2.5. Mast Configurations

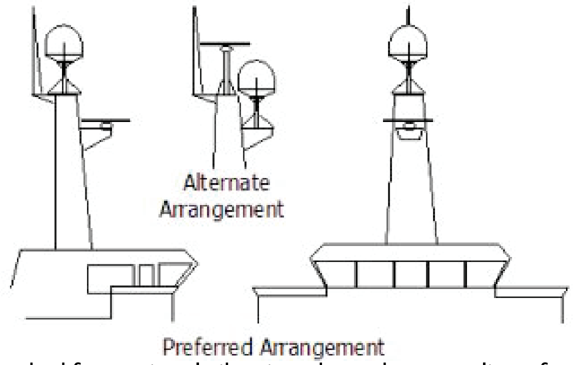
Sea Tel recommends the ADE be mounted on the ship in a location which has both a clear line-of-sight to the target satellites in all potential azimuth/elevation ranges and sufficient support against vibration excitement. If possible, mounting the ADE pedestal directly to ship deckhouse structures or other box stiffened structures is preferred. However, in many cases, this imposes limits on the clear line-of-sight the antenna system has.

Often the solution for providing the full azimuth/elevation range the antenna needs is to mount the ADE on the ship's mast. Unfortunately, masts do not consider equipment masses in design and often have harmonic frequencies of their own.

There are many designs of masts used on ships – masts are nearly as unique in design as the ship is – but the designs often fall into just a few categories. These categories can be addressed in terms of typical responses and problems with regards to vibration and mounting of ADE. The most common categories of masts are:

2.5.1. Vertical Masts

Vertical masts are a very ancient and common mast design. In essence, it is the mast derived from the sailing mast, adapted for mounting the ever-increasing array of antennae ships need to communicate with the world. This drawing of a Vertical mast shows preferred mounting of the ADE center-line above the plane of the radar, or as an alternate with the ADE mounted below the plane of the radar signal, as reasonably good installations of a satellite antenna ADE.

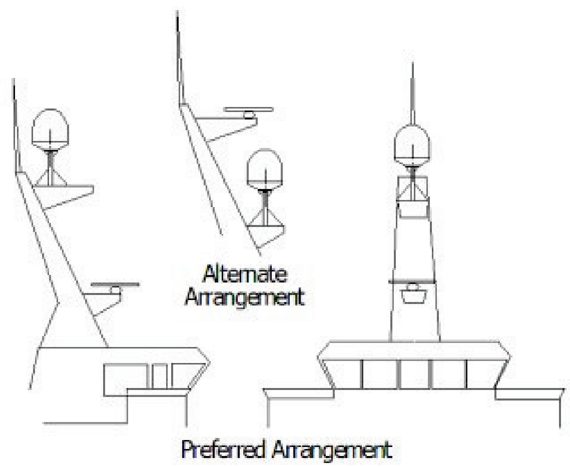


Vertical masts are most commonly still found on cargo ships – they are simple, inelegant and functional. They are also fairly stiff against torsional reaction and lateral vibrations, as long as the ADE is mounted on a stiff pedestal near the vertical centerline of the mast. If centerline mounting is impractical or otherwise prohibited, the mast platform the ADE is mounted on should be checked for torsional vibration about the centerline of the mast and the orthogonal centerline of the platform.

If the estimated natural frequency of the mast or platform is less than 35 Hertz, the mast or platform should be stiffened by the addition of deeper gussets under the platform or behind the mast.

2.5.2. Raked Masts

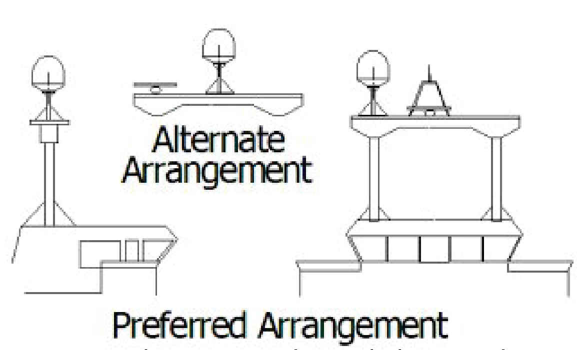
Raked masts are found on vessels where the style or appearance of the entire vessel is important. Again, the inclined mast is a direct descendant from the masts of sailing ships – as ship owners wanted their vessels to look more unique and less utilitarian, they 'raked' the masts aft to make the vessel appear capable of speed. This drawing shows a raked mast, again with the preferred ADE mounting above the radar and alternate with the ADE below the radar.



Raked masts pose special problems in both evaluating the mast for stiffness and mounting of antennae. As can be seen in the drawing all antennae must be mounted on platforms or other horizontal structures in order to maintain the vertical orientation of the antenna centerline. This implies a secondary member which has a different natural frequency than the raked mast natural frequency. In order to reduce the mass of these platforms, they tend to be less stiff than the main box structure of the raked mast. Thus, they will have lower natural frequencies than the raked mast itself. Unfortunately, the vibratory forces will act through the stiff structure of the raked mast and excite these lighter platforms, to the detriment of the antenna.

2.5.3. Girder Masts

Girder masts are large platforms atop a pair of columns. Just like girder constructions in buildings, they are relatively stiff athwart ship – in their primary axis – but less stiff longitudinally and torsionally. An example of a girder mast is shown in this drawing, with the preferred ADE mounting outboard and above the radar directly on one of the columns and alternate with the ADE centered on the girder above the plane of the radar.



The greatest weakness of girder masts is in torsion – where the girder beam twists about its vertical centerline axis. As with all mast designs discussed so far, mounting the antenna in line with the vertical

support structure will reduce the vibration tendencies. Mounting the antenna directly above the girder columns provides ample support to the antenna pedestal and locates the antenna weight where it will influence the natural frequency of the mast the least.

2.5.4. Truss Mast

Truss masts are a variant on the girder mast concept. Rather than a pair of columns supporting a girder beam, the construction is a framework of tubular members supporting a platform on which the antennae and other equipment is mounted. A typical truss mast is shown in this photograph.

Like a girder mast, truss masts are especially stiff in the athwart ship direction. Unlike a girder mast, the truss can be made to be nearly as stiff in the longitudinal direction. Truss masts are particularly difficult to estimate the natural frequency – since a correct modeling includes both the truss structure of the supports and the plate/diaphragm structure of the platform. In general, though, the following guidelines apply when determining the adequate support for mounting an antenna on a truss mast:

1. Antenna ADE pedestal gussets should align with platform stiffeners which are at least 200 millimeters in depth and 10 millimeters in thickness.
2. When possible, the antenna ADE pedestal column should align with a vertical truss support.
3. For every 100 Kilograms of ADE weight over 250 Kilograms, the depth of the platform stiffeners should be increased by 50 millimeters and thickness by 2 millimeters.

Sea Tel does not have a recommended arrangement for a truss mast – the variability of truss mast designs means that each installation needs to be evaluated separately.

2.6. Safe Access to the ADE

Safe access to the ADE should be provided. Provisions of the ship's Safety Management System with regard to men aloft should be reviewed and agreed with all personnel prior to the installation. Installations greater than 3 meters above the deck (or where the access starts at a deck less than 1 meter in width) without cages around the access ladder shall be provided with means to latch a safety harness to a fixed horizontal bar or ring.

The access hatch for the ADE shall be oriented aft, or inboard, when practical. In any case, the orientation of the ADE access hatch shall comply with the SMS guidelines onboard the ship. Nets and other safety rigging under the ADE during servicing should be rigged to catch falling tools, components or fasteners.

2.7. Below Decks Equipment Location

The Antenna Control Unit, Terminal Mounting Strip and Base Modem Panel are all standard 19" rack mount, therefore, preferred installation of these items would be in such a rack. The ACU mounts from the front of the rack. The Terminal Mounting Strip and Base Modem Panel mount on the rear of the rack.

The Satellite Modem, router, VIOP adapter(s), telephone equipment, fax machine, computers and any other associated equipment should also be properly mounted for shipboard use.

Plans to allow access to the rear of the ACU should be considered.

2.8. Cables

During the site survey, walk the path that the cables will be installed along. Pay particular attention to how cables will be installed all along the path, what obstacles will have to have be routed around, difficulties that will be encountered and the overall length of the cables. The ADE should be installed using good electrical practice. Sea Tel recommends referring to IEC 60092-352 for specific guidance in choosing cables and installing cables onboard a ship. Within these guidelines, Sea Tel will provide some very general information regarding the electrical installation.

In general, all cable shall be protected from chaffing and secured to a cableway. Cable runs on open deck or down a mast shall be in metal conduit suitable for marine use. The conduit shall be blown through with dry air prior to passing cable to ensure all debris has been cleared out of the conduit and again after passing the cable to ensure no trapped

moisture exists. The ends of the conduit shall be sealed with cable glands (preferred), mastic or low VOC silicon sealant after the cables have been passed through.

Cables passing through bulkheads or decks shall be routed through approved weather tight glands.

2.8.1. ADE/BDE Coaxial Cables

The first concern about the coaxial cables installed between the ADE & BDE is length. This length is used to determine the loss of the various possible coax, Heliax or fiber-optic cables that might be used. You should always provide the lowest loss cables to provide the strongest signal level into the satellite modem.

Signal cable shall be continuous from the connection within the ADE radome, through the structure of the ship to the BDE. Splices, adapters or dummy connections will degrade the signal level and are discouraged.

Be careful of sharp bends that kink and damage the cable. Use a proper tubing bender for Heliax bends.

Penetrations in watertight bulkheads are very expensive, single cable, welded penetrations that must be pressure tested.

Always use good quality connectors that are designed to fit properly on the cables you are using. Poor quality connectors have higher loss, can allow noise into the cable , are easily damaged or fail prematurely.

In as much as is possible, don't lay the coaxes on power cables. Try to have some separation from Inmarsat & GPS cables that are also passing L-band frequencies or Radar cables that may inject pulse repetition noise –as error bits - into your cables.

2.8.2. Antenna Power Cable

Be cautious of length of the run, for voltage loss issues, and assure that the gauge of the wires is adequate for the current that is expected to be drawn (plus margin). Antenna power is not required to be from a UPS (same one that supplies power to the below decks equipment), but it is recommended.

Power cable shall comply with the provisions of IEC 60092-350 and -351 in so far as practicable. Power cable may be routed through the same conduit as the signal cable from the junction box to the base of the ADE. Power cables shall pass through separate radome penetrations from the signal cable.

The power cable shall be continuous from the UPS (or closest circuit breaker) to the ADE connections within the radome. The power circuits shall be arranged so that 'active,' 'common' and 'neutral' (ground) legs are all made or broken simultaneously. All circuit legs shall be carried in the same cable jacket.

2.8.3. Air Conditioner Power Cable

If your system includes a marine air conditioner (available with the 81 inch radome ONLY), run an AC power cable to it from a breaker, preferably from a different phase of the electrical system than supplies power to the ADE & BDE. Be EXTREMELY cautious of length of the run for voltage loss and gauge of the wires for the current that is expected to be drawn.

Power cable shall comply with the provisions of IEC 60092-350 and -351 in so far as practicable. Power cable may be routed through the same conduit as the signal cable from the junction box to the base of the ADE. Power cables shall pass through separate radome penetrations from the signal cable.

The power cable shall be continuous from the closest circuit breaker to the ADE connections within the radome. The power circuits shall be arranged so that 'active,' 'common' and 'neutral' (ground) legs are all made or broken simultaneously. All circuit legs shall be carried in the same cable jacket.

2.8.4. ACU Power Cable/Outlet

The AC power for the ACU and other below decks equipment is not required to be from a UPS (same one that supplies power to the ADE), but it is recommended.

Power cable shall comply with the provisions of IEC 60092-350 and -351 in so far as practicable.

2.8.5. Gyro Compass Cable

Use good quality shielded cable (twisted pairs, individually foil wrapped, outer foil with braid overall is best) You only need 2-wire for NMEA signal, 4-wire for Step-By-Step and 5-wire for Synchro … always use shielded cable. Be cautious of length and gauge of the run for voltage loss issues.

2.9. Grounding

All metal parts of the ADE shall be grounded to bare metal at the mounting pedestal. Grounding straps from the base of the ADE to a dedicated lug on the mounting pedestal are preferred, but grounding may also be accomplished by exposing bare metal under all mounting bolts prior to final tightening. Preservation of the bare metal should be done to prevent loss of ground.

Grounding should be ensured throughout the entire mounting to the hull. While it is presumed the deckhouse is permanently bonded and grounded to the hull, in cases where the deckhouse and hull are of different materials a check of an independent ground bonding strap should be made. Masts should be confirmed to be grounded to the deckhouse or hull.

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3. Installation

Your antenna pedestal comes completely assembled in its radome. This section contains instructions for unpacking, final assembly and installation of the equipment. It is highly recommended that installation of the system be performed by trained technicians.

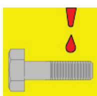
The installation instructions for your system are below.

3.1. Unpacking and Inspection

Exercise caution when unpacking the equipment.

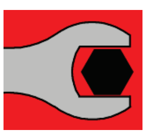
1. Unpack the crates. Carefully inspect the radome surface for evidence of shipping damage.
2. Unpack all the boxes.
3. Inspect everything to assure that all materials have been received and are in good condition.

3.2. Assembly Notes and Warnings



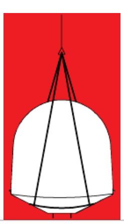
***NOTE**: All nuts and bolts should be assembled using the appropriate Loctite thread-locker product number for the thread size of the hardware.*

Loctite #	Description
222	Low strength for small fasteners.
242	Medium strength
638	High strength for Motor Shafts & Sprockets.
2760	Permanent strength for up to 1" diameter fasteners.
290	Wicking, High strength for fasteners which are already assembled.

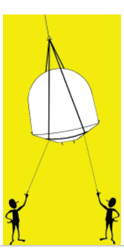


***WARNING**: Assure that all nut & bolt assemblies are tightened according to the tightening torque values listed below:*

SAE Bolt Size	Inch Pounds	Metric Bolt Size	Kg-cm
1/4-20	75	M6	75.3
5/l6-18	132	M8	150
3/8-16	236	M10	270
1/2-13	517	M12	430



***WARNING**: Hoisting with other than a webbed four-part sling may result in catastrophic crushing of the radome. Refer to the specifications and drawings for the fully assembled weight of your model Antenna/Radome and assure that equipment used to lift/hoist this system is rated accordingly.*

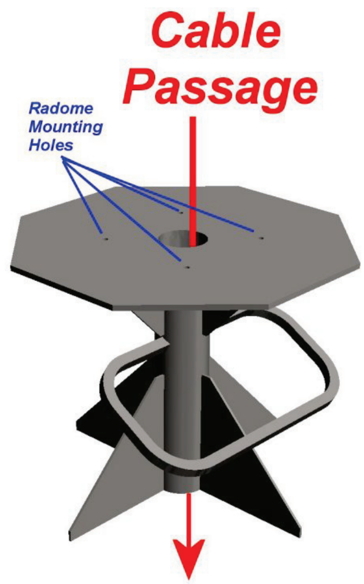


***CAUTION**: The antenna/radome assembly is very light for its size and is subject to large swaying motions if hoisted under windy conditions. Always ensure that tag lines, attached to the radome base frame, are attended while the antenna assembly is being hoisted to its assigned location aboard ship.*

3.3. Installing the ADE

The antenna pedestal is shipped completely assembled in its radome. Please refer to the entire Site Survey chapter of this manual.

Base Hatch Access - Mounting the radome directly on the deck, or platform prevents access to the hatch in the base of the radome unless an opening is designed into the mounting surface to allow such entry. If there is no access to the hatch the only way to service the antenna is to remove the radome top. Two people are required to take the top off of the radome without cracking or losing control of it, but even with two people a gust of wind may cause them to lose control and the radome top may be catastrophically damaged (see repair information in the radome specifications) or lost.



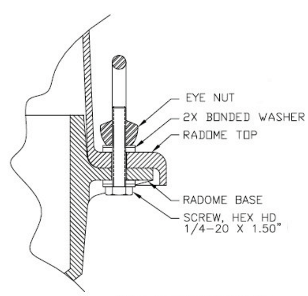
If access to the hatch cannot be provided in the mounting surface, provide a short ADE mounting stanchion to mount the ADE on which is tall enough to allow access into the radome via the hatch.

Ladder rungs must be provided on all mounting stanchions greater than 3-4 feet tall to allow footing for personnel safety when entering the hatch of the radome.

Cable Passage - The radome base is designed with a bottom center cable passage and Roxtec® Multidiameter® blocks for cable strain relief. The recommended cable passage in the 50, 60, 61 and 66 inch radomes is through the bottom center of the radome base, down through the ADE mounting stanchion, through the deck and into the interior of the ship.

Bottom center cable passage is recommended, however, a strain relief kit is provided with the system if off-center cable entry is required. ***Note: Strain relief installation procedure, provided in the Drawings chapter, MUST be followed to assure that the cored holes are properly sealed to prevent moisture absorption and de-lamination of the radome base.***

3.3.1. Prepare the 61" Radome Assembly

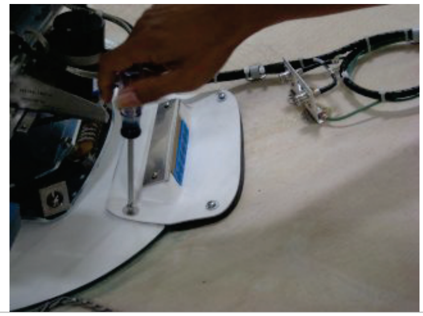
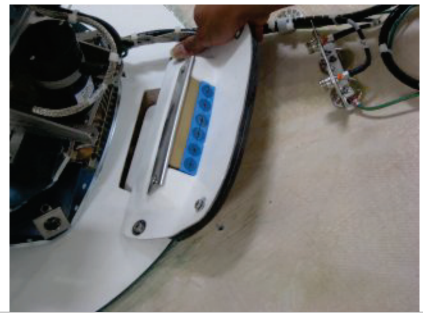
1. Remove the side walls of the Radome crate. 2. Lift the pallet using a forklift and/or jacks. 3. From the under side of the pallet, remove the 4 shipping bolts which attach the ADE to its' pallet. Discard this shipping hardware.	
4. Remove four equally spaced bolts around the radome flange. Save these nuts and bolts to be re-installed later. 5. Install four lifting eyebolts in the vacant holes in the flange of the radome.. (Hardware provided in the radome installation kit). Keep the original perimeter bolt hardware to be re-installed after the ADE has been installed.	 EYE NUT ASSEMBLY

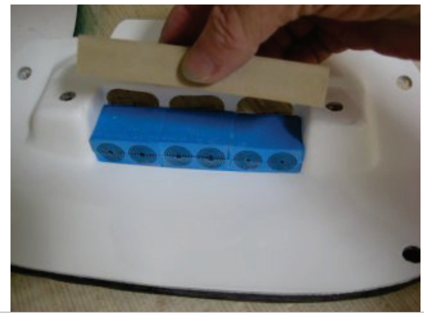
6. Attach shackles and four part web lifting sling arrangement to the eyebolts. 7. Attach a suitable length tagline to one of the eyebolts. 8. After hoisted into place the lifting eyes are to be removed & replaced with the stainless hardware that was removed in step 4 (the eyes are galvanized with bare thread that will rust if left exposed to the weather).	

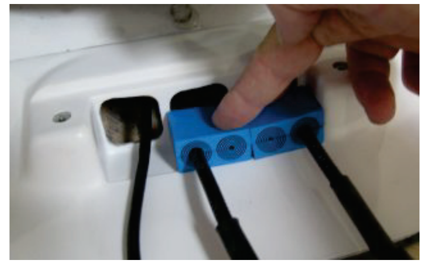
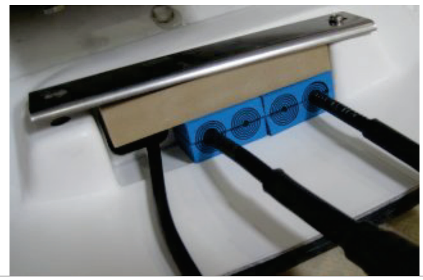
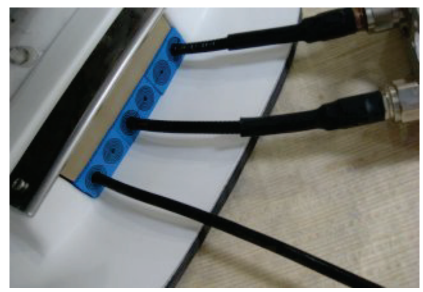
3.3.2. Installing the 61" Radome Assembly

The antenna pedestal is shipped completely assembled in its radome.

1. Man the tag line(s). 2. Hoist the antenna assembly off the shipping pallet, by means of a suitably sized crane or derrick, to allow access to bottom of radome assembly. 3. Open the hatch by pressing the round release button in the center of the black latches and gently push the hatch up into the radome. Place the hatch door (gel coat surface up) inside the radome on the far side of the antenna pedestal. 4. Inspect the pedestal assembly and reflector for signs of shipping damage.	
5. Peel the paper off of the mounting pad (provided in the radome installation kit) to expose the sticky side of the pad, align it to the mounting holes and press it in place on the underside of the radome base.	
6. Using Loctite 271, install the 4 mounting bolts (provided in radome mounting kit) into the radome base.	

7. Remove the hardware in the cable mounting frame.	
8. Lift the cable mounting frame out from the cable passage channel. **NOTE: If the bottom center cable passage will NOT be used, it is recommended that the strain reliefs be installed in place of this cable mounting frame. Other locations around the radome base are MUCH thicker, requiring longer strain reliefs than the ones provided by Sea Tel. Refer to the strain relief installation procedure provided in the Drawings chapter of this manual.**	
9. Man the tag line and have the crane continue lifting the ADE up and hover above the mounting site on the ship. 10. Carefully route AC Power, ground strap/cable (see Grounding info below) and Fiber-Optic cables through the cable passage in the bottom center of the radome base and through the cable channel under the lower base plate of antenna. **NOTE: Suitable strain relief should be provided below the mounting surface to prevent the cables from being kinked where the cables exit the bottom of the radome.**	
11. Allow enough service loop to terminate these cables to the circuit breaker assembly and fiber-optic transceiver unit respectively (see cable termination information below). **HINT: It may be easier to connect, or tie-wrap, the coaxes and power cable temporarily.** 12. Lower radome assembly into the mounting holes, positioned with the BOW reference of the radome as close to parallel with centerline of the ship as possible (any variation from actual alignment can be electrically calibrated if needed). 13. Using Loctite 271, install the 4 fender washers and hex nuts (provided in the radome installation kit), from the underside of the mounting surface, to affix the radome to the mounting surface. Tighten to torque spec.	

14. Remove the clamp bar and Roxtec® Multidiameter® blocks from their cable mounting frame in the cable passage channel.	
15. Remove the rubber bar from the top of the Roxtec® Multidiameter® blocks.	
16. Remove the Roxtec® Multidiameter® blocks from the cable mounting frame.	
17. Pass the fiber-optic and power cable through the cable mounting frame. **HINT: Again, It may be easier to connect, or tie-wrap, the coaxes and power cable temporarily.** 18. Re-install the cable mounting frame onto cable passage channel using the four screws and flat washers that were removed in step 7 above. .	
19. Peel layers out of the upper and lower Roxtec® Multidiameter® blocks to provide an opening in the block that is just smaller than the outer diameter of the cable that will pass through it. When compressed the block should provide clamping force on the cable and prevent it from moving in the block.	

20. Two cables may be passed through each of the Roxtec® Multidiameter® CM-20w40 blocks provided. 21. If cables larger than 1.65cm/0.65in outer diameter will be used, larger single-cable Roxtec® Multidiameter CM-40 10-32 blocks are available to allow three cables of up to3.25cm/1.28in diameter to be used. The **rubber bar** and the **three double-cable** Roxtec® Multidiameter blocks will be **replaced** by the **three larger Roxtec® Multidiameter blocks**.	
HINT: It may be helpful to put the clamp bar and rubber bar in place (held loosely by one screw) to hold some of the Roxtec® Multidiameter blocks in place while you complete the others.	
22. Re-install the clamp bar using the hardware removed in step 14 above. 23. Remove the tag lines. 24. Remove the lifting sling. 25. Remove the 4 lifting eye nuts and re-install the original perimeter bolt hardware (the eyes are galvanized with bare thread that will rust if left exposed to the weather). Save the lifting eye hardware in case lifting of the ADE is required in the future.	

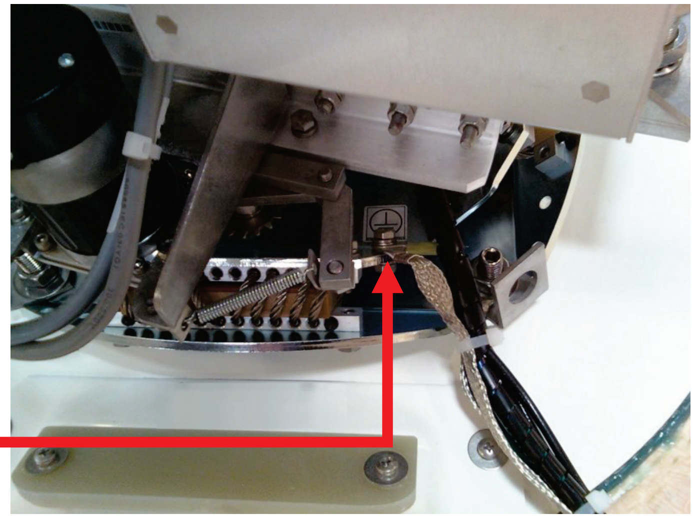
3.4. *Grounding the Pedestal*

The antenna pedestal must be grounded to the hull of the ship. A grounding point is provided on the upper base plate to ground the pedestal. You must provide a cable, or strap, that is of sufficient gauge and length to ground the pedestal to the nearest grounding point of the hull (this is usually on or near the mounting surface).

Solid strap is the conductor of choice for low impedance RF ground connections because the RF currents tend to flow along the outer surface and the strap has a large, smooth, surface area to take full advantage of this effect.

Braid is the conductor of choice where flexibility is required. Sea Tel uses braid to cross axes of the antenna pedestal and to connect various subassemblies together.

Wire is the easiest to install, the easiest to connect and is readily available with a weather protective jacket. 4 awg and 6 awg bare solid copper wire is commonly used as safety grounds and very basic lightning protection grounds. 2 awg stranded wire is often used for lightning grounding and bonding and it much more flexible.

1. Provide a grounding strap/cable (of adequate gauge for the length) to provide a good ground drain for the antenna pedestal. This cable/strap must also be insulated where it may be exposed to weather. **NOTE**: **Minimum** gauge should not be smaller than **10 AWG**, even for a short cable run. 2. Route the ground cable/strap into the radome with the coax and power cables. 3. Connect grounding strap/cable to the burnished ground point on the upper base plate. 4. Route the ground strap/cable through one of the Roxtec® Multidiameter® blocks with the other power and coax cables.	
5. Connect the other end of the grounding strap/cable to a burnished ground point on, or near, the mounting surface. Bi-metal coupling plate may be required to get good electrical coupling. Protective coating should be applied to prevent the grounding point from rusting or corroding.	

3.5. *Removing the Shipping/Stow Restraints PRIOR to Power-Up*

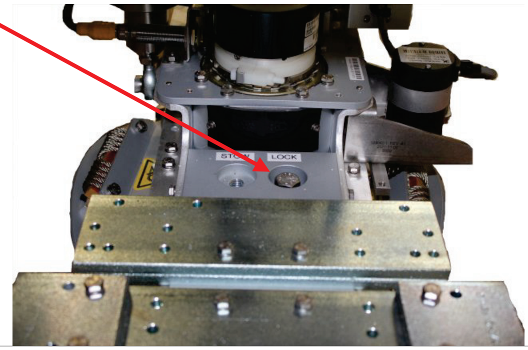
The order in which the restraints are removed is not critical.

	***CAUTION***: *There are three shipping/Stow restraints on this antenna pedestal that* ***MUST*** *be removed,* ***before energizing*** *the antenna, for normal operation.*

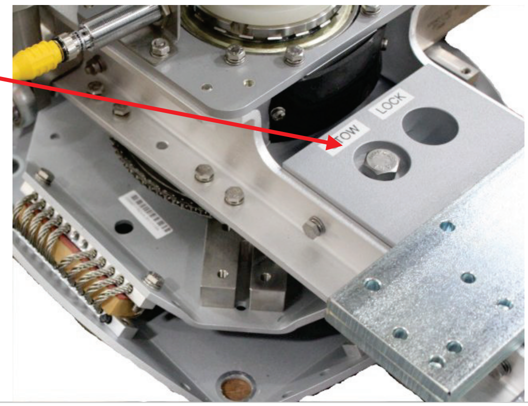
3.5.1. Removing the AZ Shipping/Stow Restraint

1. The AZ Shipping/Stow restraint is formed by a pin bolt that is lowered into a channel in a stowage block on the upper plate of the pedestal (as shown).	

2. To un-stow the antenna, remove the pin bolt from the LOCK position.

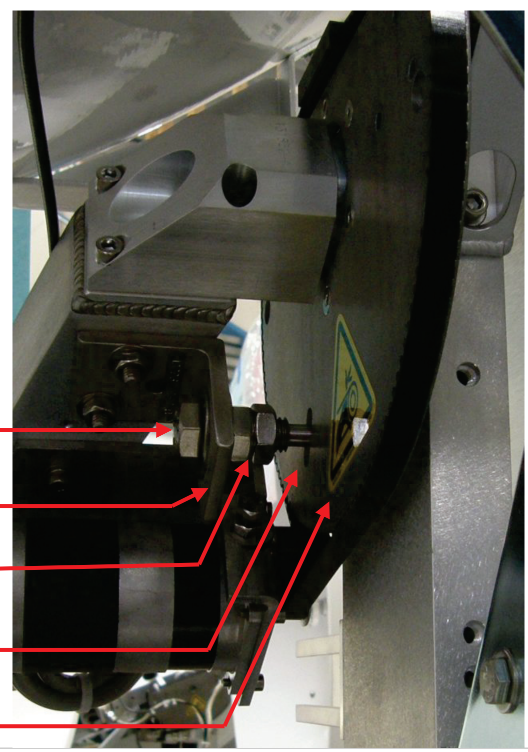


3. Install the pin bolt into the STOW hole and tighten. This assures that it does not get lost and will be ready for re-use if the antenna needs to be stowed again at a later date.
4. Verify that the antenna is able to rotate freely in Azimuth.



3.5.2. Removing the EL Shipping/Stow Restraint

1. The EL Shipping/Stow restraint is formed by a Stow pin-bolt mounted through a bracket and is engaged into a hole/slot in the elevation driven sprocket when the dish is at zenith (90 degrees elevation).
2. In the stowed position the hardware from left to right is Stow pin-bolt head, washer, bracket, washer, hex nut, hex nut so that the pin section of the Stow pin-bolt is inserted into the hole in the elevation driven sprocket.



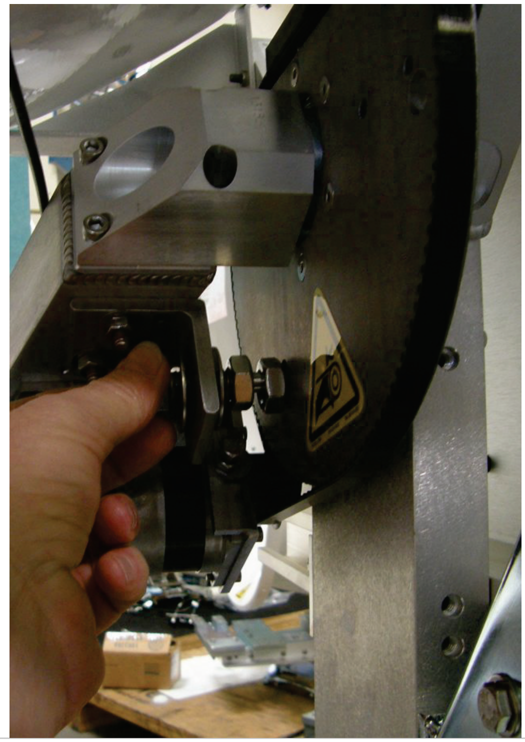
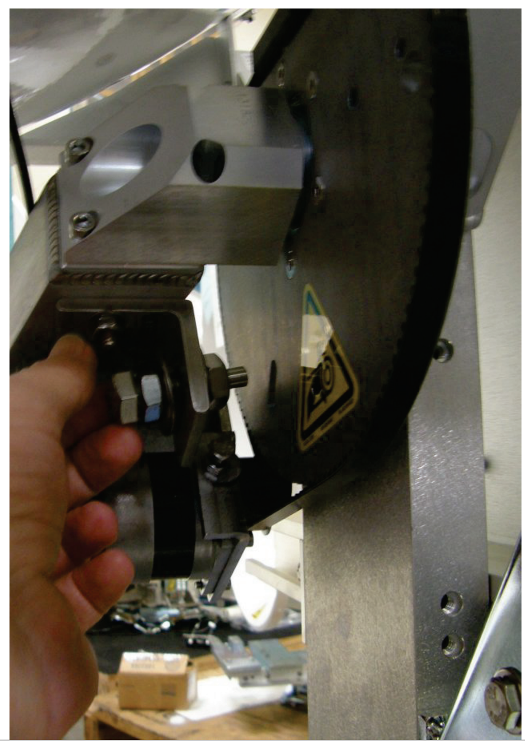
EL Stow Pin-Bolt head

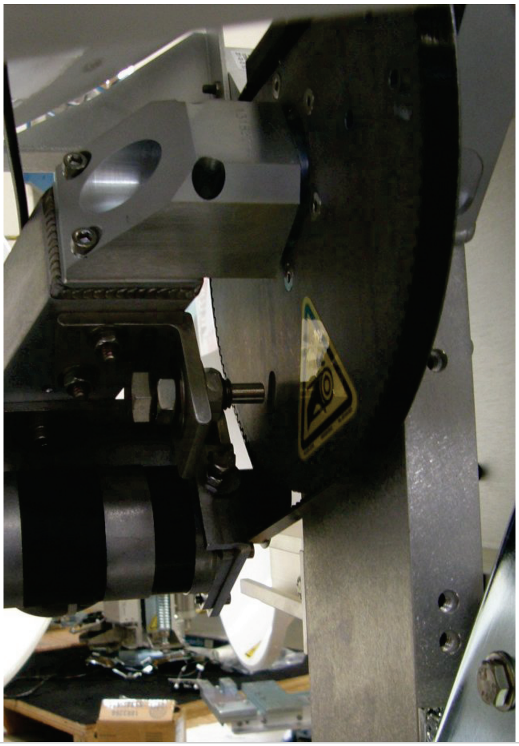
Bracket

2 Hex Nuts

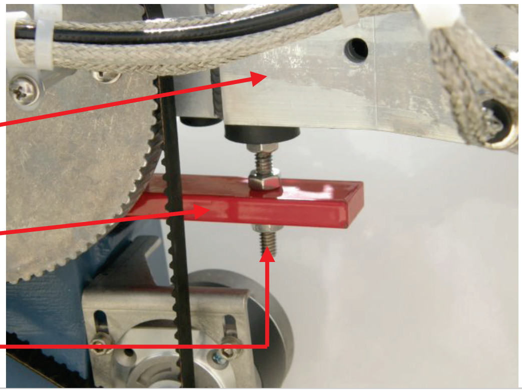
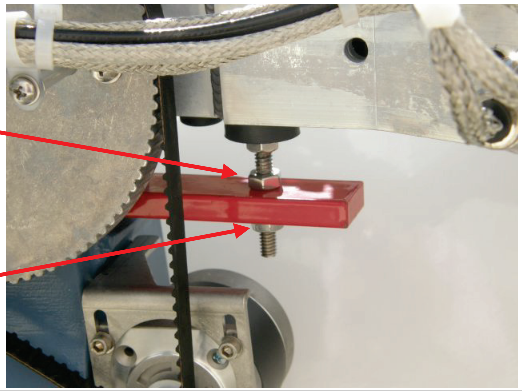
Pin inserted into Elevation Driven Sprocket

Elevation Driven Sprocket

3. To un-restrain the elevation axis of the antenna, unthread the two hex nuts. Remove the hex nuts and washer from the stow pin-bolt. 4. Remove the stow pin-bolt from the bracket.	
5. Remove the washer from the stow pin-bolt and thread one of the 2 hex nuts onto the bolt and tighten. 6. Put one of the washers onto the stow pin-bolt and insert it into the bracket toward the elevation driven sprocket. 7. Put the other washer, and then the other hex nut onto the bolt.	

8. Tighten the hex nut to prevent the hardware from loosening while in the un-stowed configuration. 9. Verify that the antenna rotates freely through its full elevation range of motion.	

3.5.3. Removing the CL Shipping/Stow Restraint

1. The CL Shipping/Stow restraint is formed by a red locking bar with adjustable bumpers at each end of the bar. This mechanism is placed under the cross-level beam to lock it in place. Cross-Level Beam CL Shipping/Stow bar Adjustable CL Locking Bumpers (only one end shown)	
2. To un-restrain the cross-level axis of the antenna use a 7/16" open end wrench to loosen the nut on the top side of the locking bar (either end of the bar). 3. Remove the bottom nut off of that adjustable bumper. 4. Remove the adjustable bumper from the locking bar.	

5. Extract the locking bar from the underside of the cross-level beam and retain these parts for later re-use if it becomes necessary to stow the antenna. 6. Verify that the antenna rotates (tilts left & right from level) freely through its full cross-level range of motion.	

3.6. Installing the Below Decks Equipment.

3.6.1. General Cautions & Warnings

CAUTION - Electrical Shock Potentials exist on the Gyro Compass output lines*. Assure that the Gyro Compass output is turned* ***OFF*** *when handling and connecting wiring to the MXP.*

CAUTION *- Allow only an* ***authorized dealer*** *to install or service the your Sea Tel System components. Unauthorized installation or service can be dangerous and may invalidate the warranty.*

3.7. Connecting the Below Decks Equipment

Connect this equipment as shown in the System Block Diagram. Install the equipment in a standard 19 inch equipment rack or other suitable location. Optional slide rails are available.

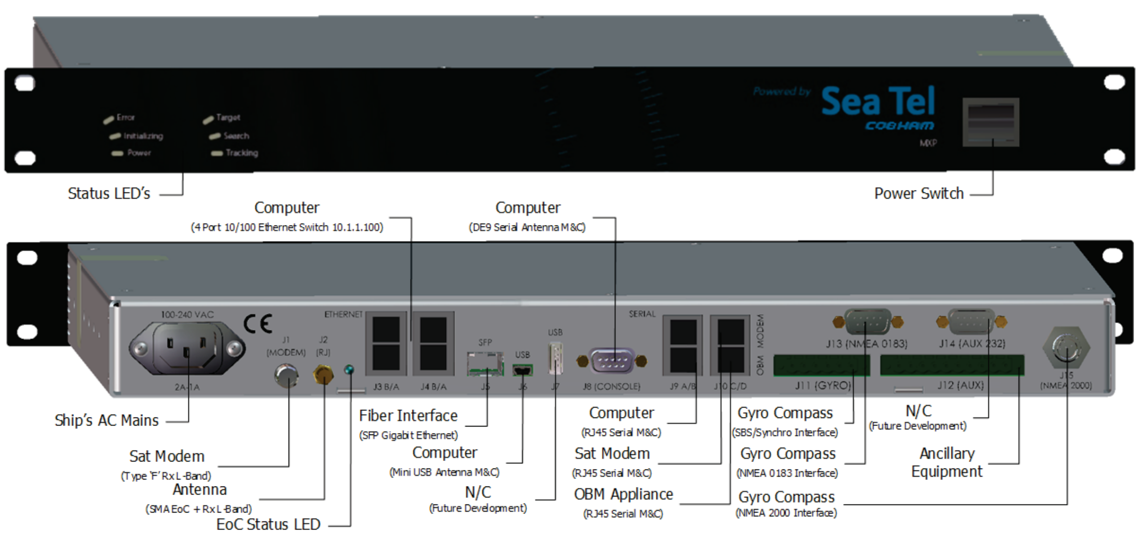
3.7.1. Connecting the ADE AC Power Cable

Connect the AC Power cable that supplies power to the ADE to a suitably rated breaker or UPS.

3.7.2. Connecting the BDE AC Power Cables

Connect the AC Power cables that supply power to the Below Decks Equipment (MXP, Satellite Modem, phone, fax, computer and all other equipment) to an outlet strip fed from a suitably rated breaker or UPS.

3.7.3. Media Xchange Point™ (MXP) Connections



3.7.3.1. Ships Mains

Connect the desired power cord from the rear panel of the MXP to power sourse (UPS power recommended).

3.7.3.2. J1 (Modem RX)

Connect this RXIF Output to the satellite modem RX Input.

3.7.3.3. J2 Antenna RX

Connect this RXIF Input from the antenna to the MXP.

3.7.3.4. Ethernet 4 Port 10/100 switch

Ethernet connections to computer, satellite modem LAN devices as desired.

3.7.3.5. Fiber Interface

SFP Gigabit Ethernet connection.

3.7.3.6. Mini-USB Computer M&C Connection

Mini-USB M&C connection, if desired.

3.7.3.7. USB

Not connected - -Future development.

3.7.3.8. J9 A/B Serial

Computer RJ-45 Serial M&C connection.

3.7.3.9. J10C Modem

RJ-45 Serial M&C connection to Satellite Modem Console Port.

3.7.3.10. J10D OBM

RJ-45 Serial M&C connection to Out of Band Management equipment, if used.

3.7.3.11. J11 Gyro

Gyro SBS or Synchro connections.

3.7.3.12. J13 NMEA 0183

NMEA 0183 I/O connections..

3.7.3.13. J12 Aux 232

Auxiliary wired RS-232 connection.

3.7.3.14. J14 Aux 232

Not connected - -Future development.

3.7.3.15. J15 NMEA 2000

NMEA 2000 I/O connection..

3.7.4. Other BDE connections

Connect your other Below Decks Equipment (ie, telephone, fax machine and computer equipment) to complete your configuration.

3.8. Final Checks

3.8.1. Visual/Electrical inspection

Do a visual inspection of your work to assure that everything is connected properly and all cables/wires are secured.

3.8.2. Electrical - Double check wiring connections

Double check all your connections to assure that it is safe to energize the equipment.

3.9. Setup - Media Xchange Point™ (MXP)

Now that you have installed the hardware, you will need to setup, calibrate and commission the antenna.

You may also need to load/update the modem option file, which is not part of the scope of this manual, contact the airtime provider NOC for guidance.

At the very least, you will need to set up the antenna system for:

- Connect & configure a ships computer for accessing the MXP.
- The gyro compass signal being provided by the ship.
- The tracking receiver frequency settings for the satellite to be used (configure satellites).
- Set up / configure all satellites that the system might use as the ship travels.
- Check/Set Home Flag Offset.
- Set up Blockage zone(s) as needed.
- Acquire the desired satellite.
- Optimize targeting (Auto or manual trim).
- Arrange for commissioning & cross-pol isolation testing with the NOC.
- Conduct cross-pol isolation testing with the NOC.
- Conduct other commissioning testing with the NOC (ie P1dB compression point).
- If this is a Dual Antenna installation configuration, you will have to balance the TX levels of the two antennas while online with the NOC (refer to procedure in the Dual Antenna Arbitrator manual).
- It is strongly recommended that you down, and save, the system INI file (contains all of the system parameters). Save this file in a convenient location.

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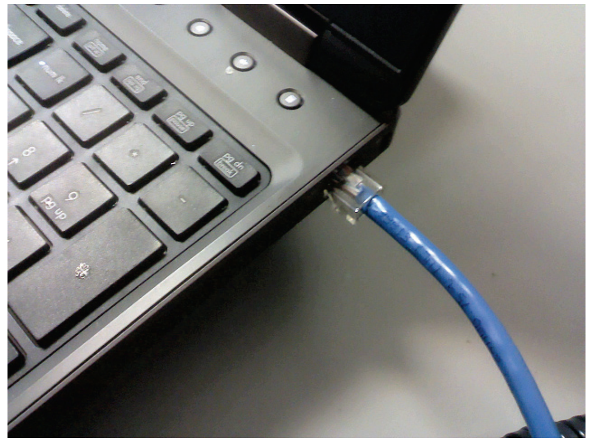
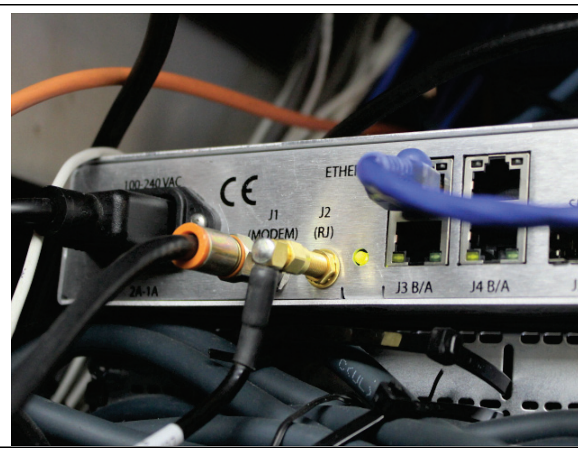
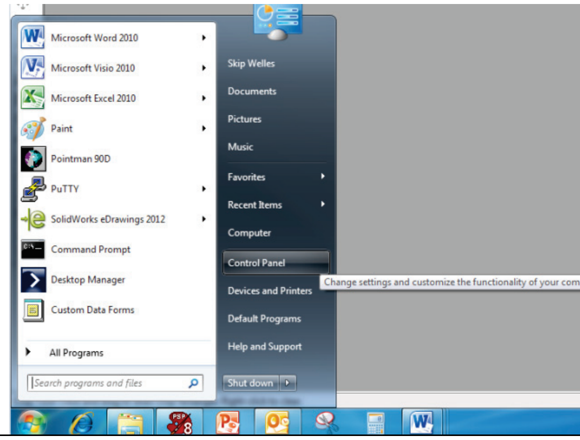
4. Configuring a Computer for the MXP

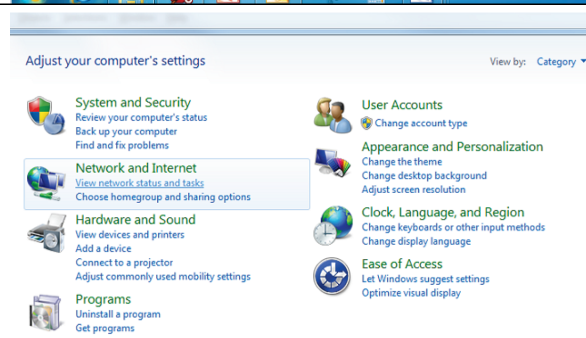
The first thing you need to do is to configure your computer so that it will display the MXP screens. Follow these instructions to accomplish that.

1. Connect a LAN cable to the back of your computer.	
2. Connect the other end of the LAN cable to the back of the MXP.	
3. Power on the MXP.	

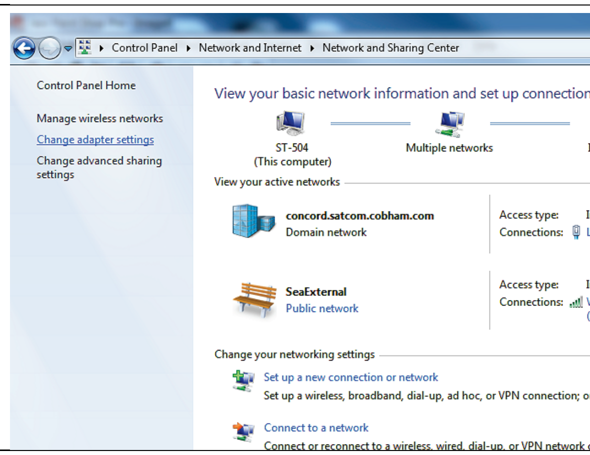
4. From your computer desktop, click the Control Panel button.



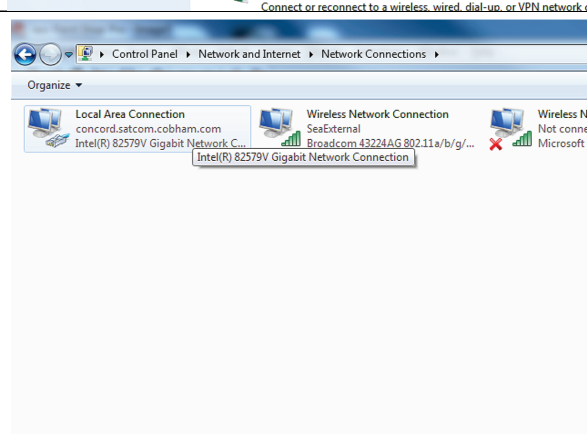
5. Click on “View network status and tasks”.



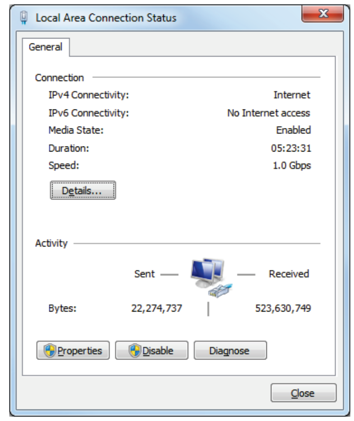
6. Click “Change adapter settings”.



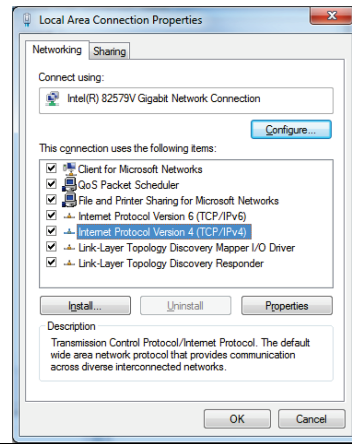
7. Click on “Local Area Connection.”



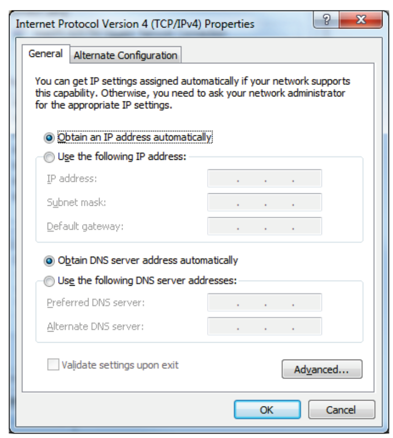
8. Click on “Properties”.



9. Click on “Internet Protocol Version 4 (IPv4)”.

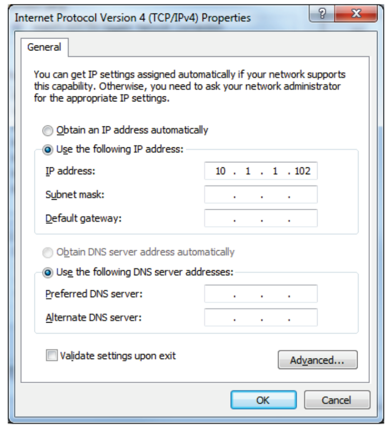


10. Click on “Use the following IP address:

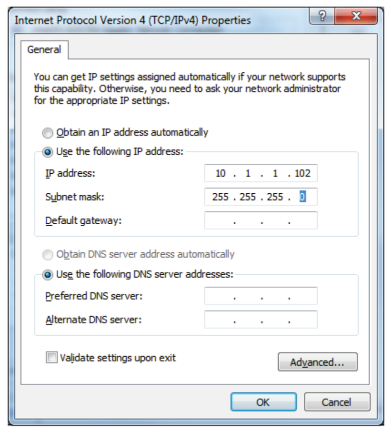


11. In the IP Address boxes, enter “10.1.1.102” (This is for the IP address of your computer).

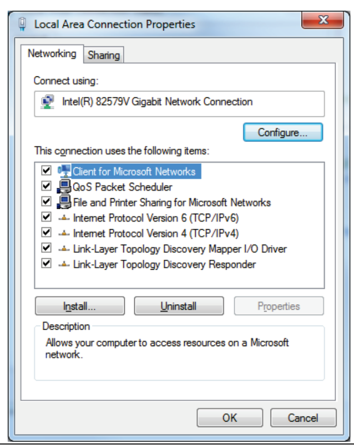
NOTE: You could use 101, 102, 103, etc. as long as it is not the same as the address of the MXP, which is “**10.1.1.100**” (default).



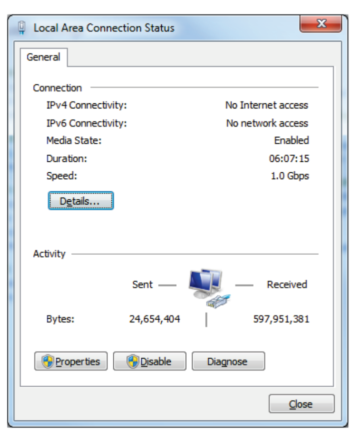
12. On the second line, enter Subnet Mask of “255.255.255.0”.
13. Then click the “OK” button.



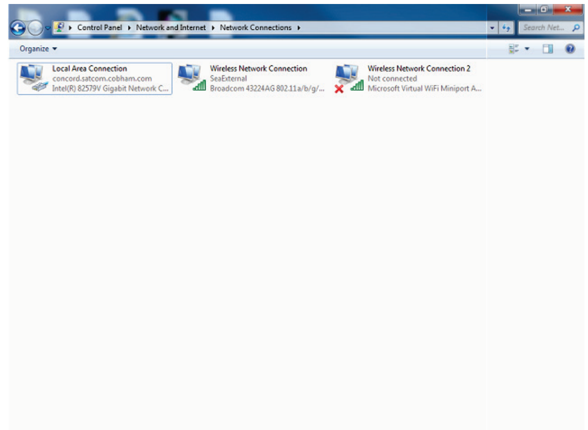
14. Back at the Local Area Connection Properties screen, click the “OK” button.



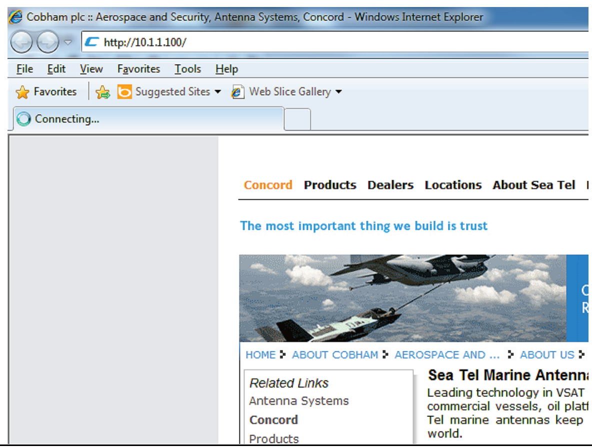
15. Click the “Close” button.



16. Close the Control Panel.

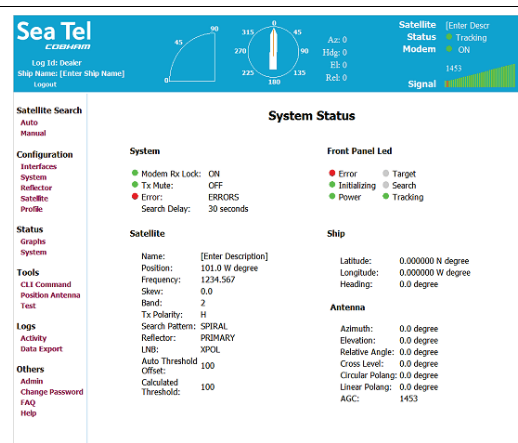


17. Open your browser, and enter the URL: “10.1.1.100”.



18. At the log in screen enter the user name (Dealer, SysAdmin, or User). Contact Sea Tel Service for the password.

19. After you log in you will see the System Status screen



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5. Setup – Ship's Gyro Compass

The Ships Gyro Compass connection provides true heading (heading of the ship relative to true North) input to the system. This allows the ICU to target the antenna to a "true" Azimuth position to acquire any desired satellite.

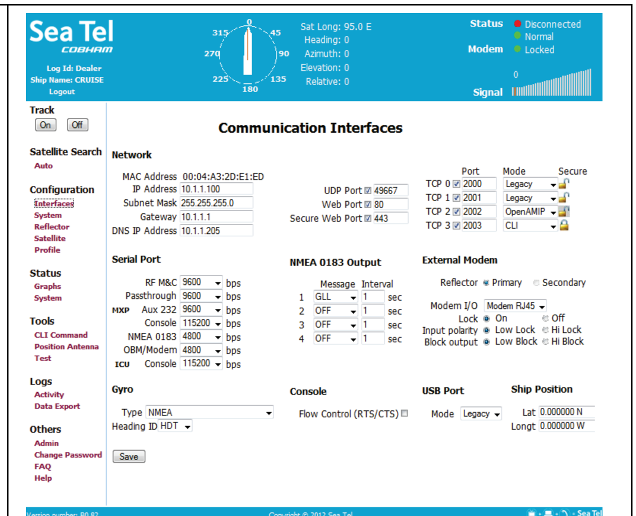
After targeting, this input keeps the antenna stabilized in Azimuth (keeps it pointed at the targeted satellite Azimuth).

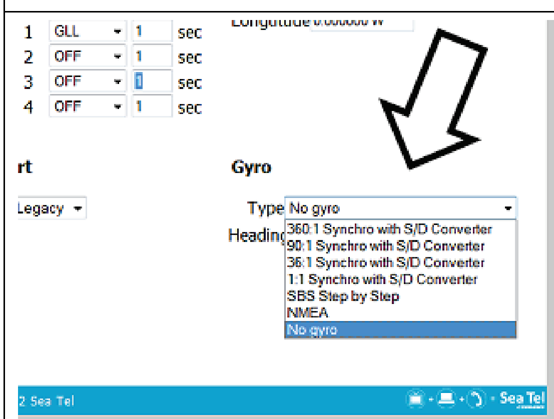
5.1. *Setting the Gyro Type*

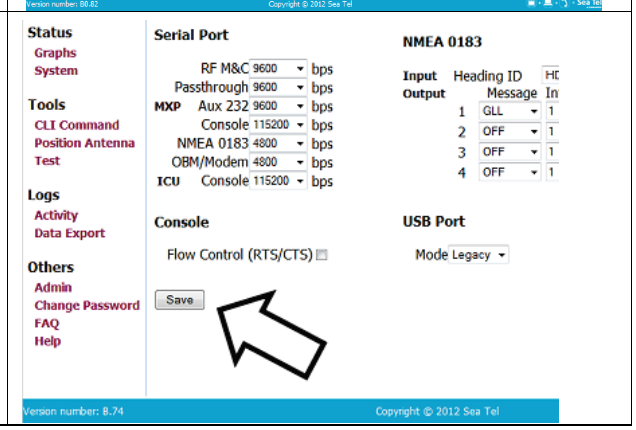
The GYRO TYPE parameter selects the type of gyro compass interface signal, the appropriate hardware connections, and the ratio of the expected input signal for ship turning compensation. Default GYRO TYPE parameter for all systems is Step-By-Step so that the ICU will properly follow for Step-By-Step or NMEA gyro signals.

If the Ships Gyro Compass output is Synchro, or there is NO Gyro Compass, the GYRO TYPE parameter must be set correctly to properly read and follow the Ships Gyro Compass signal that is being provided. To manually update the Gyro Type parameter:

1. Go to the Communications Interface screen.
2. Click the Gyro Type drop down menu.
3. Select the correct Gyro type.
4. Click Save, at the bottom left area of the screen.







5.2. *If there is NO Ships Gyro Compass*

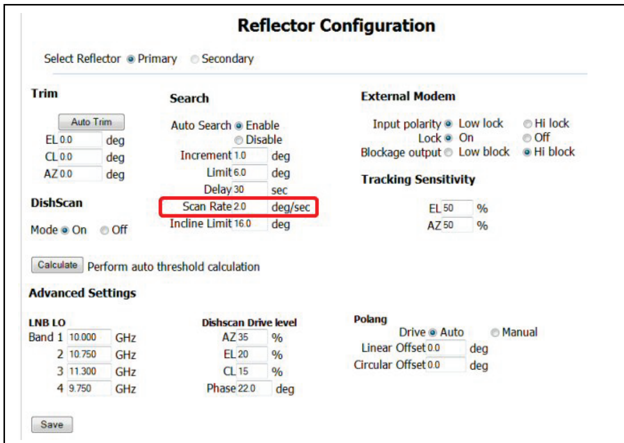
Without heading input to the system the MXP will NOT be able to easily target, or stay stabilized ON, a "true" azimuth pointing angle. This will make satellite acquisition much more difficult and the true azimuth value that any given satellite should be at will not be displayed correctly.

This mode of operation is NOT recommended for ships or any other vessel that turns in the water. A better solution would be to provide a Satellite Compass (multiple GPS Antenna device) to provide true heading input to the ACU. These devices are readily available and are much less expensive than a Gyro Compass.

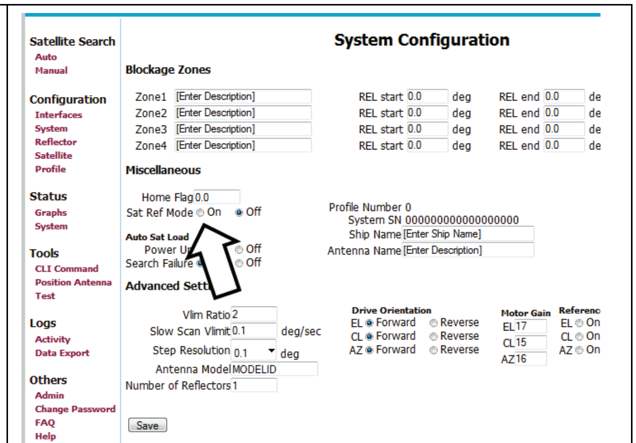
If there is NO Gyro Compass (ie on a large stationary rig which is anchored to the ocean floor) set the GYRO TYPE parameter to "No Gyro" or to "Fixed".

Fixed mode is used when you do not have a gyro compass, but the ship/vessel/rig is stationary at a fixed heading that you can manually enter for satellite targeting. This allows you to use a standard (small) search pattern and acquire the satellite relatively quickly.

No gyro mode is used when you do not have a gyro compass, the ship does turn and you will use "Sky Search" to initially acquire the satellite. The Sky Search drives the antenna to the calculated elevation angle and then drives azimuth CW 360 degrees, steps elevation up and then drives azimuth CCW 360 degrees and continues to alternately steps elevation up/down and drives azimuth alternately CW/CCW 360 degrees. Because of this large search area, acquiring the satellite will take MUCH longer than if you have valid heading input.



To change: Set the Scan Rate parameter to 5 deg/sec.



Turn on SAT REF Mode. (It must be turned on.)

This combination of settings will cause "No Gyro" Search pattern to be use to find the desired satellite (refer to the setup – Searching lesson).

6. Setup – Tracking Receiver – VSAT

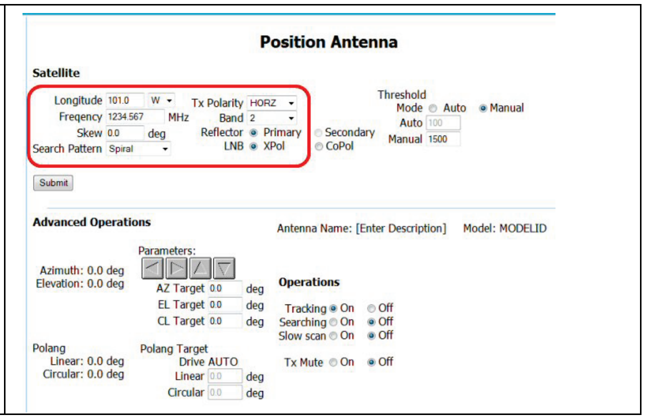
6.1. Determining the IF Tracking Frequency (MHz)

The IF Tracking frequency parameter is a value entered into the MXP MHZ Sub-Menu. The value itself may be provided by your air-time provider and the MHz value will be entered directly in this sub-menu.

Or, the RF downlink frequency of a specific carrier on the desired satellite can be obtained from a satellite website and calculated by using the formula RF- LO = IF. When you take the Satellite Transponder Downlink RF value and subtract the LNB's Local Oscillator (LO) Value, the resultant value will equal the Intermediate Frequency (IF). It is this IF value that will be entered into the MXP for tracking purposes. The MHz and KHz are entered as a single value.

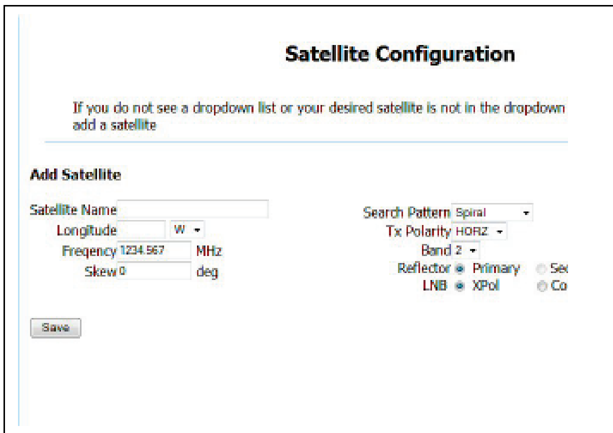
Example: Assuming an LNB LO value of 11.25GHz: We want to track a satellite downlink carrier at 12268.250 MHz.
12268.250 MHz – 11250.000 MHz = 1018.250 MHz IF

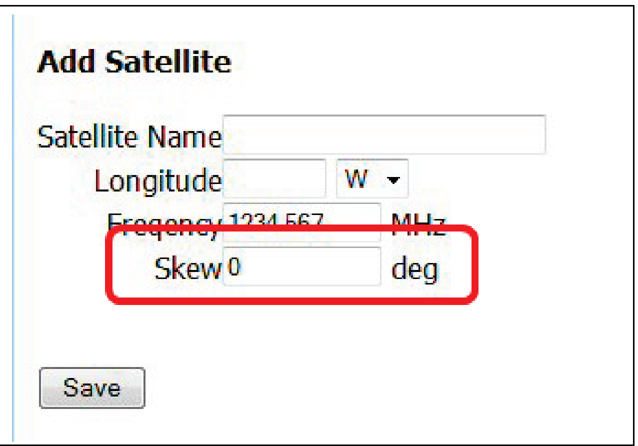
1. Enter the entire six digits of the "megahertz and kilohertz" is simply entered as one value. This is done in the Position Antenna screen.



6.2. SAT SKEW

SKEW is used to optimize the polarization of the feed to the desired satellite signal. It is entered when a known satellite is skewed. Use Polang to peak the polarity.





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7. Setup – Home Flag Offset

Home Flag Offset is used to calibrate the relative azimuth value of the antenna to the bow line of the ship. This assures that the encoder input increments/decrements from this initialization value so that the encoder does not have to be precision aligned. When the antenna is pointed in-line with the bow (parallel to the bow) the "Relative" display value should be 000.0 Relative (360.0 = 000.0). Good calibration is especially important if blockage mapping is used, because the values entered into the AZ LIMIT parameters are entered in Relative Azimuth. The default Home Flag Offset value saved in the ICU is 000.

The default mounting of the radome is with its bow reference in-line with the bow and the base hatch in-line with the stern (aft reference of the radome). There are valid reasons for mounting the ADE in a different orientation than the default. One of these would be that the hatch of radome needs to be oriented inboard of the ship for safe entry into the dome (ie ADE is mounted on the Port, or Starboard, edge of the ship and safe entry is only available from inboard deck or inboard mast rungs).

Observe initialization of the antenna. When Azimuth drives CW and then stops at "Home" position, VISUALLY compare the antennas pointing, while at Home position, to the bow-line of the ship (parallel to the Bow).

If it appears to be very close to being parallel to the bow, you will not need to change the HFO and should proceed with Optimizing Targeting. When "Optimizing Targeting" small variations (up to +/- 5.0 degrees) in Azimuth can be easily corrected using the AZ TRIM feature.

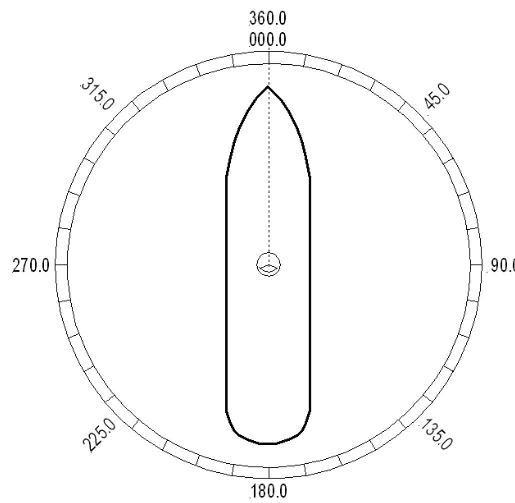


Figure 7-1 Antenna stops In-line with Bow

If it is NOT close (stops before the bow or continues to drive past the bow) HFO needs to be adjusted.

If the antenna is pointing to the LEFT of the bow line: If the antenna stops driving before the bow line, when targeting a satellite it will fall short of the desired satellite by exactly the same number of degrees that it fell short of the bow line. You must calibrate HFO using either of the methods below.

If the antenna is pointing to the RIGHT of the bow line: If the antenna continues to drive past the bow line, when targeting a satellite it will overshoot the desired satellite by exactly the same number of degrees that it went past the bow line. You must calibrate HFO using either of the methods below.

If you find that a large value of AZ TRIM parameter has been used to calibrate the antenna, This indicates that the Relative position is incorrect and should be "calibrated" using the correct HFO value instead of an Azimuth Trim offset.

If the radome was purposely rotated, has a large value of AZ TRIM or was inaccurately installed (greater than +/- 5 degrees), there are two ways of setting Home Flag to compensate for the mounting error. They are Electronic, or Mechanical, Calibration of Relative Antenna Position (Home Flag Offset).

Above, you VISUALLY compared the antenna pointing, while at "Home" position, to the bow-line of the ship and found that the antenna pointing was NOT close to being parallel to the bow-line. It stopped before the bow or went past the bow OR you found AZ TRIM has been set to a large value, therefore, HFO needs to be adjusted.

Ascertain the exact amount of error using the appropriate procedure below, enter the HFO to calibrate the antenna to the ship, save the value and re-initialize the antenna to begin using the new value.

7.1. You Found a Large AZ TRIM value:

If Targeting has been optimized by entering a large value of AZ TRIM; First, verify that you are able to repeatably accurately target a desired satellite (within +/- 1.0 degrees). Then you can use the AZ TRIM value as the HFO value (so you can set AZ TRIM to zero). Set Home Flag to the AZ Trim value that was calculated (and click SAVE) and then set the AZ Trim value to zero (and click SAVE). Both AZ TRIM and Home Flag are entered as the number of degrees and tenths of degrees.

7.1.1. You Observe "Home" Pointing is LEFT of the Bow-line:

In this example, I observe that the Home position is short of the bow line.

I estimate that it is about 45 degrees.

I target my desired satellite and record the Calculated Azimuth to be 180.5.

I drive UP (I estimated that I will need to go UP about 45 degrees) and finally find my desired satellite.

Turn tracking ON to let the ACU peak the signal up. When peaked, the Azimuth is 227.0 degrees.

I subtract Calculated from Peak (227 – 0180.5 = 46.5) and difference is 46.5 degrees.

I can calculate what the correct value for the Home position of the antenna by subtracting (because "home" was to the left of bow) this difference of 46.5 from the bow line position 360.0. Therefore "home" should be 313.5 Relative.

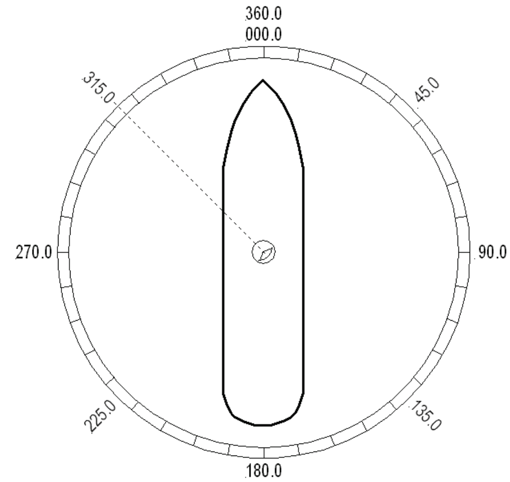


Figure 7-2 Antenna stopped before the Bow

I set, and Save, HFO to 46.5 using the Home Flag entry window, located on the System Configuration screen. After I re-initialize the relative position of the antenna is now calibrated.

7.1.2. You Observe "Home" Pointing is RIGHT of the Bow-line:

In this example, I observe that the Home position is past the bow line.

I estimate that it is about 90 degrees.

I target my desired satellite and record the Calculated Azimuth to be 180.0.

I drive DOWN (I estimated that I will need to go DOWN about 89 degrees) and finally find my desired satellite.

Turn tracking ON to let the ACU peak the signal up. When peaked, the Azimuth is 90.0 degrees.

I subtract Calculated from Peak (180.0 – 90.0 = 90.0) and difference is 90.0 degrees.

I can calculate what the correct value for the Home position of the antenna by adding (because "home" was to the right of bow) this difference of 09.0 to the bow line position 000.0. Therefore "home" should be 90.0 Relative.

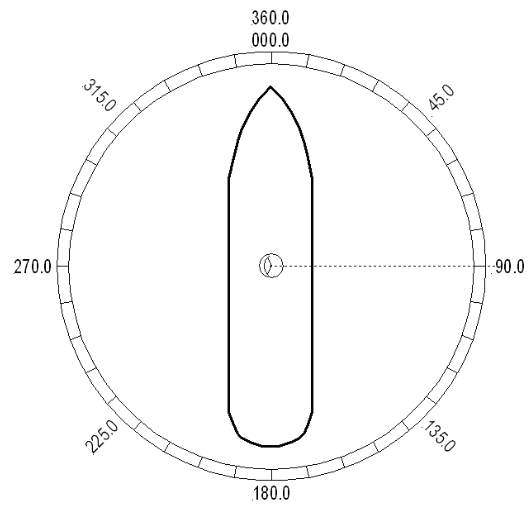


Figure 7-3 Antenna stops past the Bow

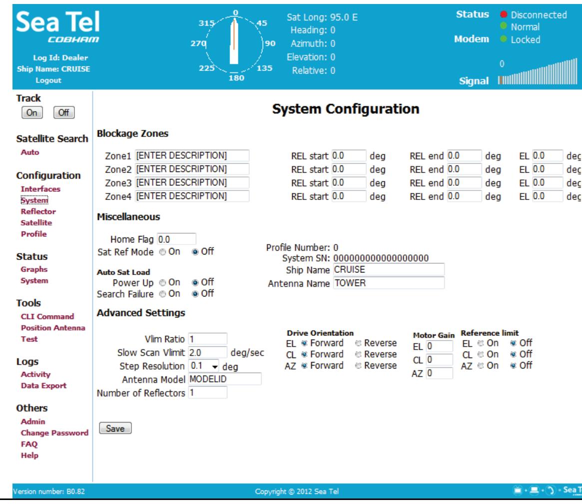
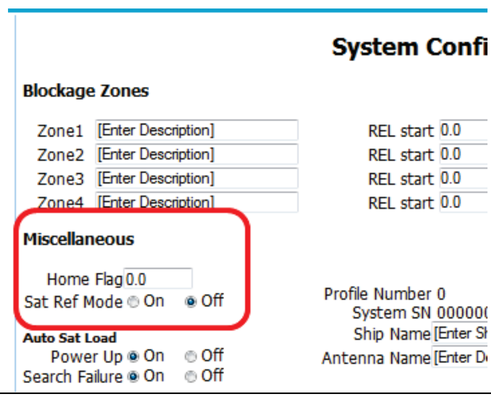
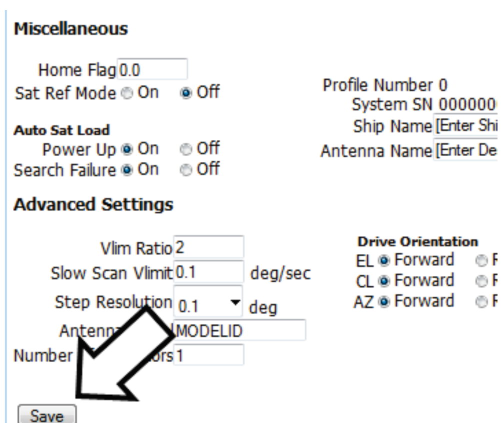
I set, and Save, HFO to 90.0 using the Home Flag entry window, located on the System Configuration screen (as shown in the previous section).

After I re-initialize the relative position of the antenna is now calibrated.

If there is a small amount of error remaining, I will use AZ TRIM in the Optimizing Targeting procedure to correct it (as shown in the previous section).

7.1.3. Entering a large value as Home Flag Offset

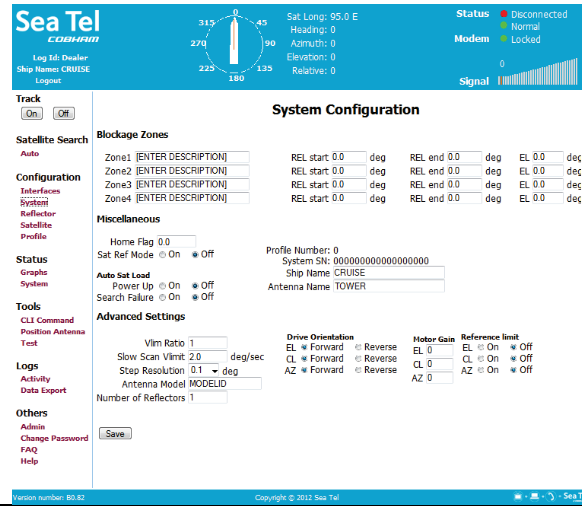
If the amount of offset is greater than +/-5 degrees, enter it as Home Flag Offset. If it is within +/-5 degrees, you should enter it in AZ TRIM.

1. Access the System Configuration screen	
2. Enter new Home Flag value (positive or negative value)	
3. Click SAVE	

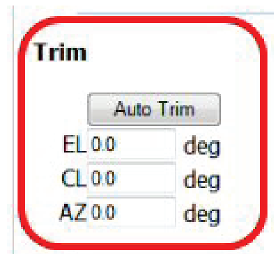
7.1.1. Entering a small value as AZ TRIM

If the amount of offset is greater than +/-5 degrees, enter it as Home Flag Offset. If it is within +/-5 degrees, you should enter it in AZ TRIM.

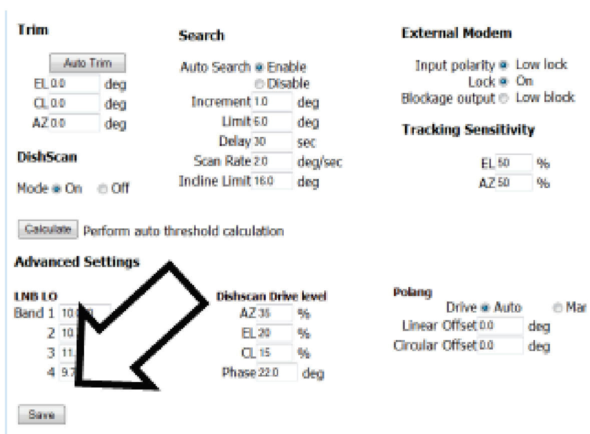
1. Access the Reflector Configuration screen



2. Use Auto Trim, or enter the small amount of AZ Trim value



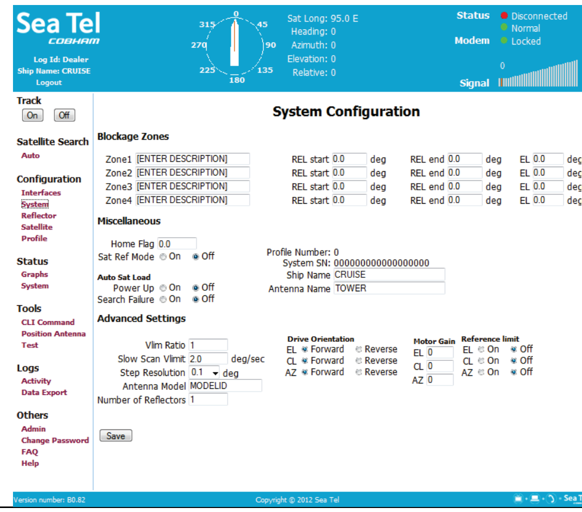
3. Click SAVE



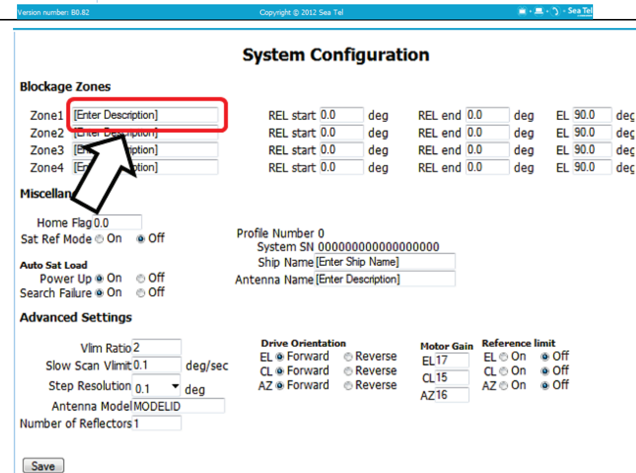
8. Setup – Blockage Zones

The Blockage Zones function inhibits the antenna from transmitting within certain pre-set zones.

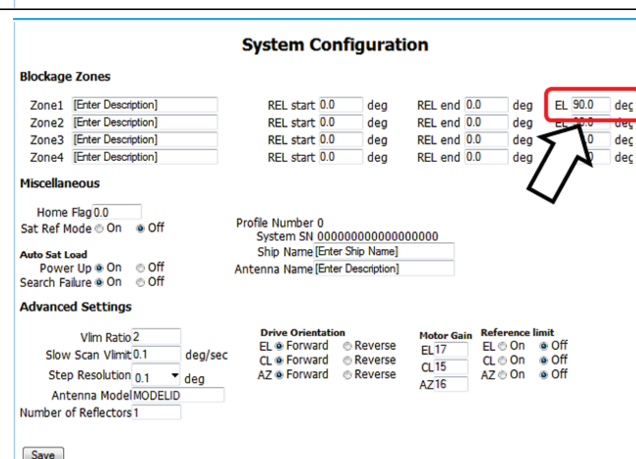
1. To set up the blockage zones go to the System Configuration screen.

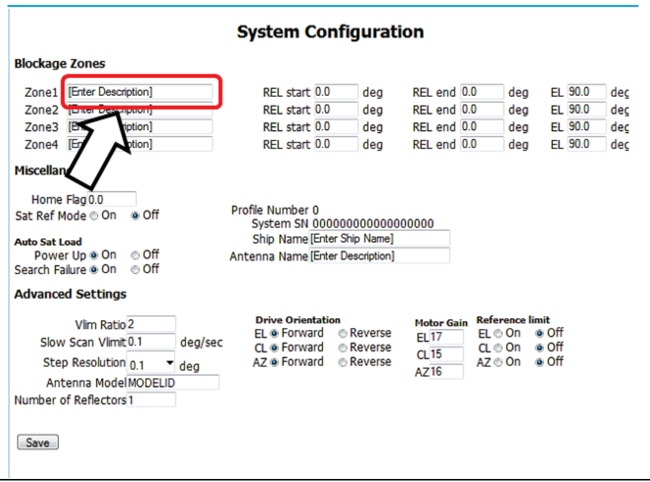


2. Notice that identifying an Azimuth blockage zone is as easy as entering the relative bearings of the start and stop points for that blockage.



3. Likewise, for Elevation, you need only to enter the elevation angle, below which you want the transmitter inhibited (blocked).



4. But wait, that's not all! You can even name each blockage zone	

9. Setup – Targeting

In this lesson you will learn how to optimize the targeting of the antenna to track on or near a desired satellite (within +/-1 degree.

9.1. AUTO TRIM

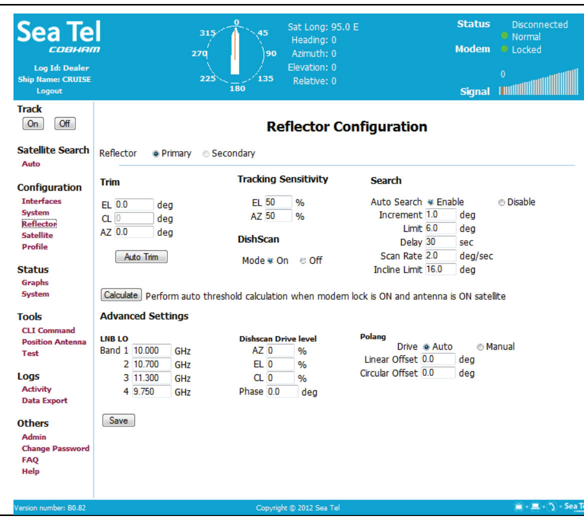
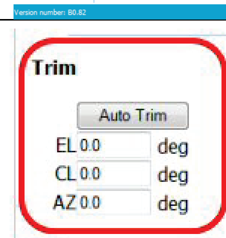
The Auto Trim function will automatically calculate and set the required Azimuth and Elevation trim offset parameters required to properly calibrate the antennas display to the mechanical angle of the antenna itself, while peaked ON satellite.

Refer to “Optimizing Targeting” in the Setup section of this manual for further details on the parameters settings.

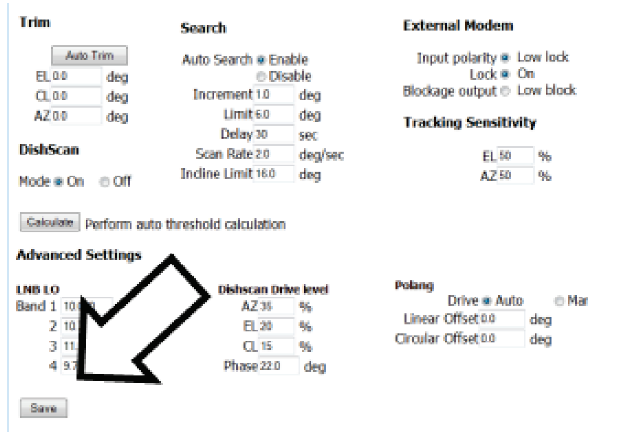
To enable this function, the Antenna MUST be actively tracking the satellite with positive Modem Lock and elevation of the antenna must be less than 83 degrees and the MXP must NOT be set for Inclined Orbit Search. After locating the satellite, with Tracking ON, wait at least 30 seconds before performing the AUTO TRIM feature, this will allow sufficient time for the antenna to peak up on signal. It is equally important that you verify that the system is tracking the CORRECT satellite (verify a RX lock indication on the satellite modem).

NOTE: The AUTO TRIM feature is NOT allowed unless all of these conditions are met:

- The antenna must be actively tracking a satellite (AGC above threshold) AND
- The antenna must have positive SAT ID (RX lock received from the Satellite Modem) AND
- The elevation angle of the antenna must be LESS than 75 degrees AND
- The antenna must NOT be set for Inclined Orbit Search.

1. To activate the Auto Trim function go to the Reflector Configuration screen.	
2. Click on the Auto Trim button. This does not save these parameters to NVRAM, in order to save to memory, click the Save button.	

3. Click SAVE

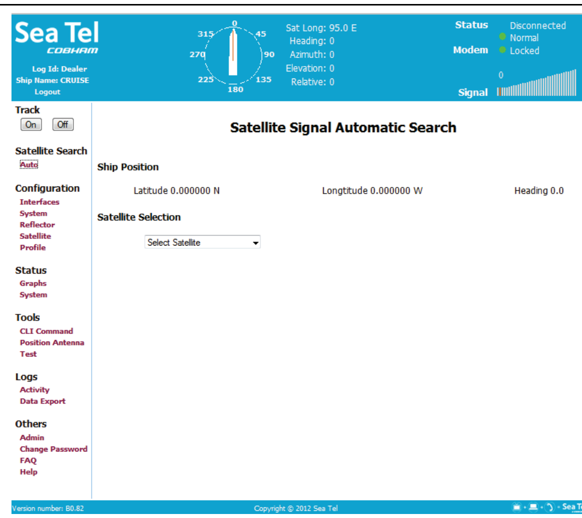


9.2. *Manually Optimizing Targeting*

1. First, assure that all of your Ship & Satellite settings in the MXP are correct.
2. Access the Satellite Search screen
3. Target the desired satellite by selecting it from the drop down list. You will see a message “Acquiring Satellite Signal...Please Wait” displayed.
4. Watch the Azimuth and Elevation values displayed in the center area of the banner and prepare to click the Track OFF button.

When targeting the antenna will initially drive to an elevation position that is 8 degrees above (or below if the elevation is greater than 83 degrees) the actual calculated position that the satellite should be at. After azimuth and polarization also finish driving, the elevation will drive to the actual elevation of the satellite

5. As soon as the elevation drives (up or down) 8 degrees click the Track OFF button and record the Azimuth and Elevation positions (these are the Calculated positions)..

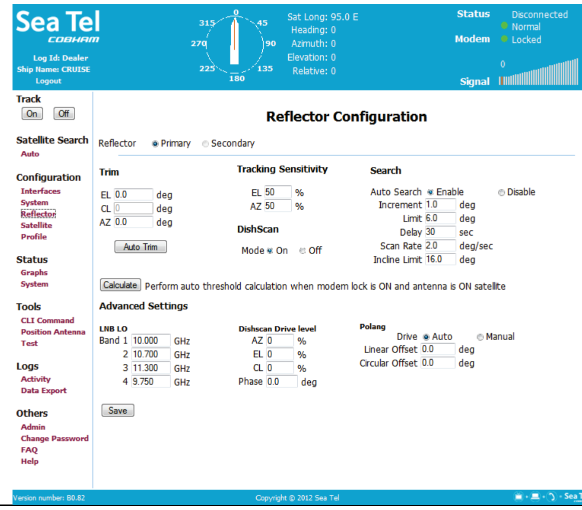


6. Click Track ON button and allow the antenna to search, acquire and track the desired satellite.

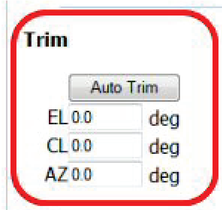
As this happens you will see “Satellite Signal Found” and “Modem Lock: LOCKED” messages displayed. Select the Position Antenna screen., turn Tracking OFF and click Save.

7. After the antenna has been tracking for several minutes, record the Azimuth and Elevation positions of the antenna (these are the Peak positions).
8. Subtract the Peak Positions from the Calculated Positions to determine the amount of Trim which is required.

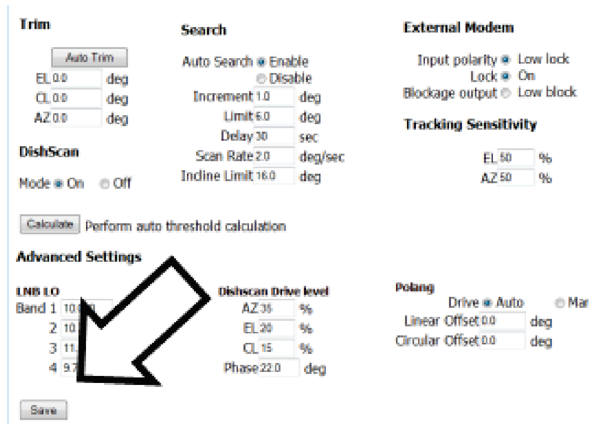
9. Access the Reflector Configuration page.



10. Enter the Elevation Trim in the EL field.
11. Enter the Azimuth Trim in the AZ field.



12. Click Save.
13. Re-target the satellite several times to verify that targeting is now driving the antenna to a position that is within +/- 1.0 degrees of where the satellite signal is located.



EXAMPLE: The antenna initially targets to an Elevation position of 38.0 degrees and an Azimuth position of 180.2. Shortly after that the Elevation drives to 30.0 degrees and Azimuth stays at 180.2 (Calculated), you find that Peak Elevation while ON your desired satellite is 31.5 degrees and Peak Azimuth is 178.0. You would enter an EL TRIM value of –1.5 degrees and an AZ TRIM of +2.2 degrees. After these trims values have been set, your peak "**ON**" satellite Azimuth and Elevation displays would be very near 180.2 and 30.0 respectively.

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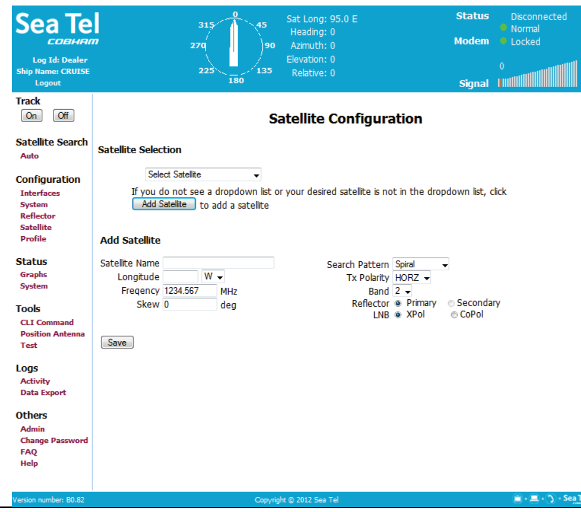
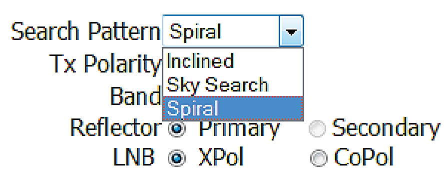
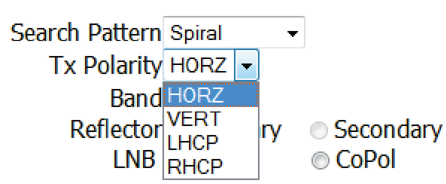
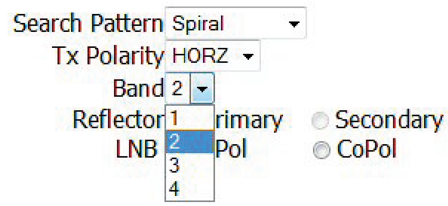
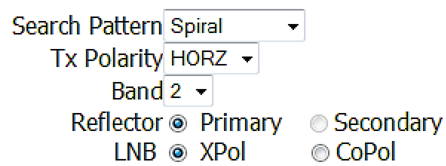
10. Setup – Satellite Configuration

The values that these parameters are set to depends on the hardware configuration required for each satellite. Configure each of the satellites that airtime services will be provided on so that any one of them can be selected, remotely or by the user onboard. The satellite selection will in turn control the hardware on the antenna pedestal to select the correct TX & RX hardware and the correct tracking settings.

Sea Tel provides quad-band LNBs as standard on the 4012 GX antennas.

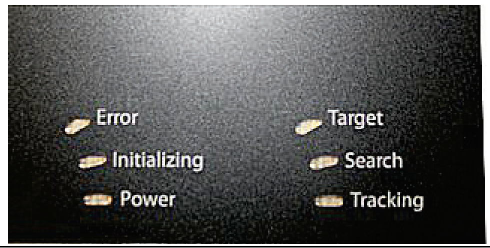
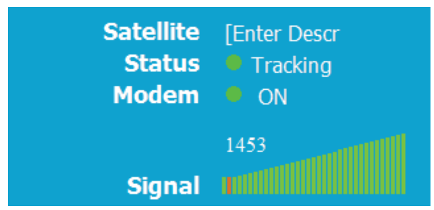
1. Access the Satellite Configuration screen. 2. Select the satellite that your airtime services will be provided on.	
3. Select the desired type of search pattern to use for this satellite.	
4. Select desired TX Polarity from the drop down menu.	

5. Select desired Band from its drop down menu.	
6. Assure that reflector is set to “Primary”. 7. Select Cross-Pol LNB (XPol) or Co-Pol LNB (CoPol) as is appropriate for this satellite.	
8. Click the Save button.	

11. Quick Start Operation

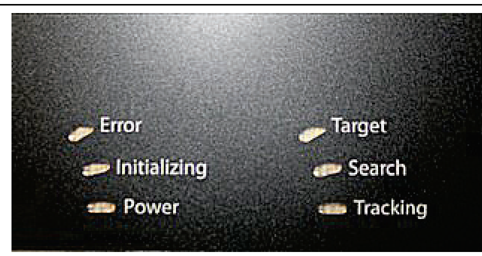
If your system has been set up correctly, and if the ship has not moved since the system was used last, the system should automatically acquire the satellite from a cold (power-up) start. Once the satellite has been acquired, the modem then should achieve lock and you should be able to use the system.

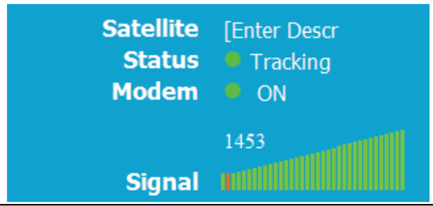
11.1. If satellite signal is found AND network lock is achieved:

<table>
<tr><td>1. Tracking will take over (front panel Tracking LED will be ON) and automatically peak the antenna position for highest receive signal level from the satellite.</td><td>
</td></tr>
<tr><td>2. When the ICU has signal above threshold AND modem has network lock the antenna will continue to track the satellite.
3. Satellite Name (if entered), Tracking indicator, Modem Lock indicator and signal level (number value and bar graph) will be displayed in the header of the MXP GUI pages.</td><td>
</td></tr>
<tr><td>Upon completion of the above, the system will continue to operate automatically, indefinitely until:
• AC power to the system is interrupted OR
• The satellite signal is blocked OR
• The ship sails into an area of insufficient satellite signal strength/level.</td><td></td></tr>
</table>

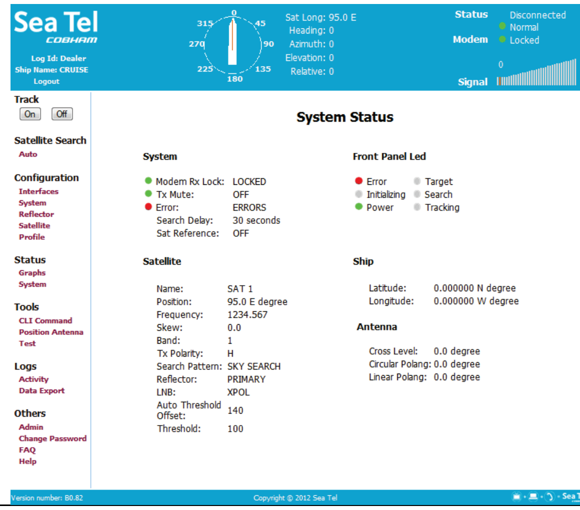
11.2. If no signal is found:

If the system does NOT automatically find the satellite from a cold start, follow the steps below:

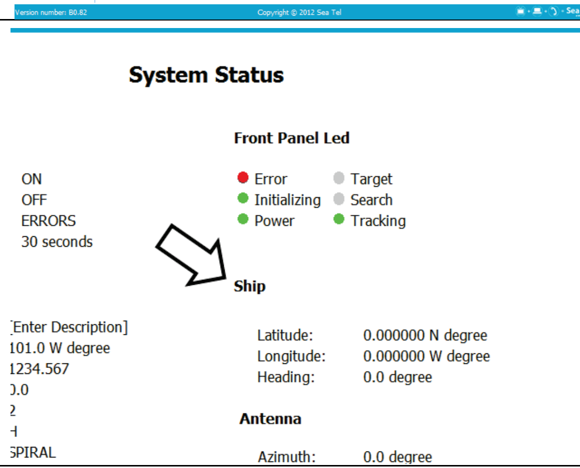
<table>
<tr><td>1. The Tracking LED will flash for a short period of time (Search Delay) followed by the Search LED coming ON.
2. The ICU will automatically move the antenna in the selected Search pattern until looking for a signal value that is greater than the threshold value (red bar in the bar graph).
3. Not finding a signal greater than Threshold, the bar graph will stay red and the antenna will reach the end of the prescribed search pattern.
4. The antenna will retarget and the cycle will repeat (Search Delay timeout, conduct search pattern followed by retarget).</td><td>
</td></tr>
</table>



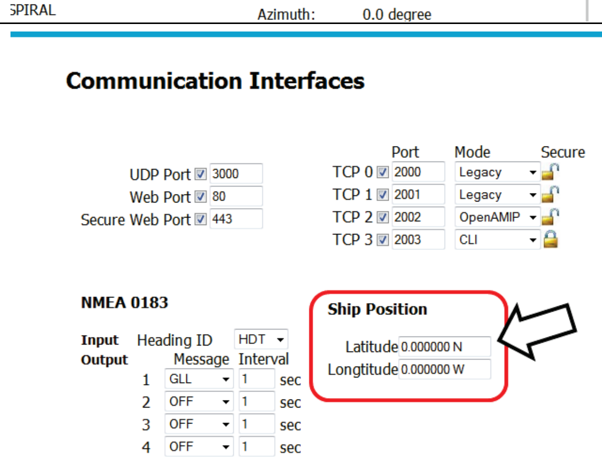
5. Check Latitude, Longitude and Heading. These should be correct, but may be updated if necessary.
6. Access the System Status screen.



7. Find the Latitude, Longitude and Heading displayed values. If they are correct skip to step 12.



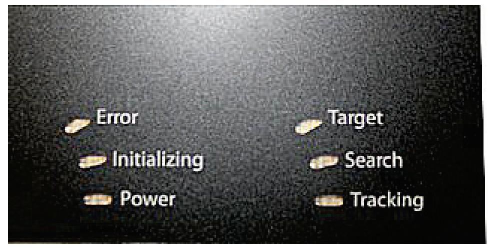
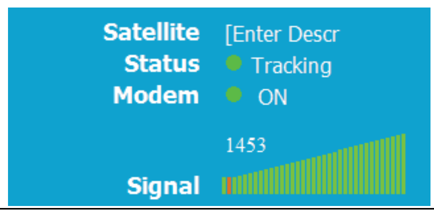
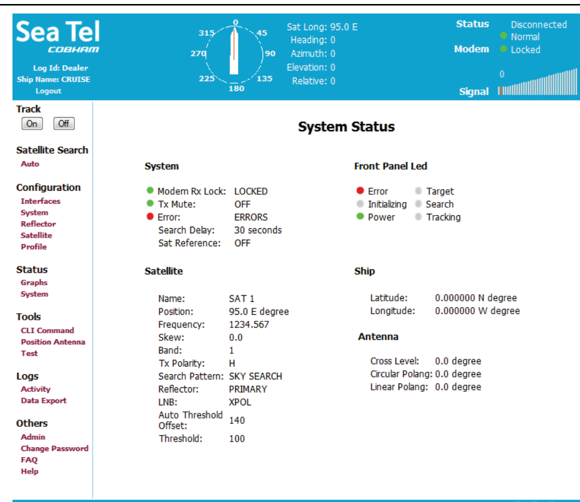
8. If the Latitude & Longitude values are not correct, access the Communication Interfaces screen and enter the ships Latitude & Longitude position in the fields provided.
9. Click Save.

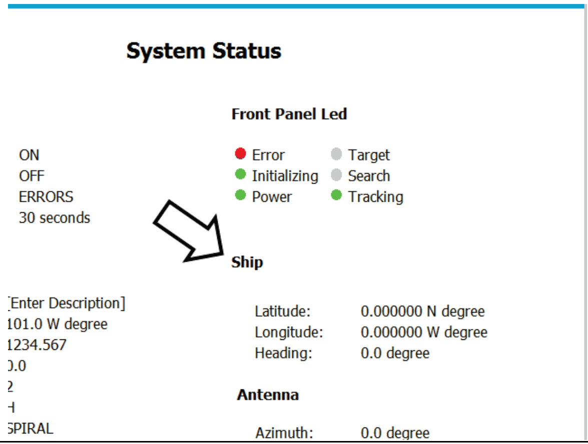


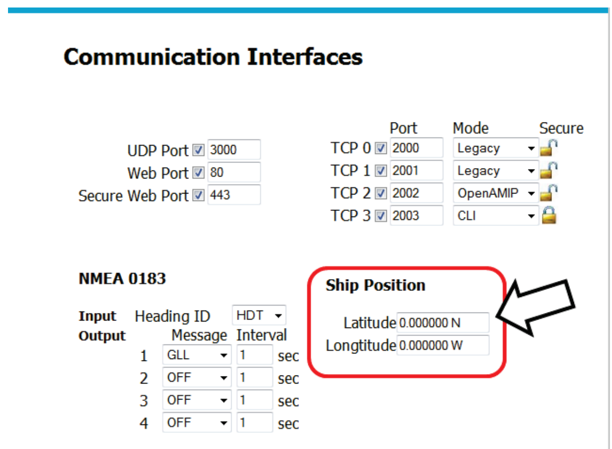
10. If the Heading value is correct, enter the correct value in the lower right field of the Communication Interfaces screen.
11. Click Save.

12. Check for blockage (this is the MOST common cause of not being able to acquire the desired satellite). 13. Verify that the correct satellite is selected. 14. Check cable connections to assure that a cable has not been disconnected.	

11.3. *If satellite signal is found but network lock is NOT achieved:*

1. The Tracking LED will flash for a short period of time (Search Delay) followed by the Search LED coming ON. 2. The ICU will automatically move the antenna in the selected Search pattern until it receives a signal value that is greater than the threshold value (red bar in the bar graph). If signal above Threshold is found, Tracking will take over (Tracking LED ON) and automatically peak the antenna position for highest receive signal level from the satellite which has been acquired. The system will wait for the modem to achieve lock. If the modem does not get lock, the antenna will resume its search pattern.	 
3. If the system does not acquire the correct satellite within the prescribed search pattern, the antenna will retarget and the cycle will repeat (Search Delay timeout, conduct search pattern followed by retarget).	
4. Check Latitude, Longitude and Heading. These should be correct, but may be updated if necessary. 5. Access the System Status screen.	

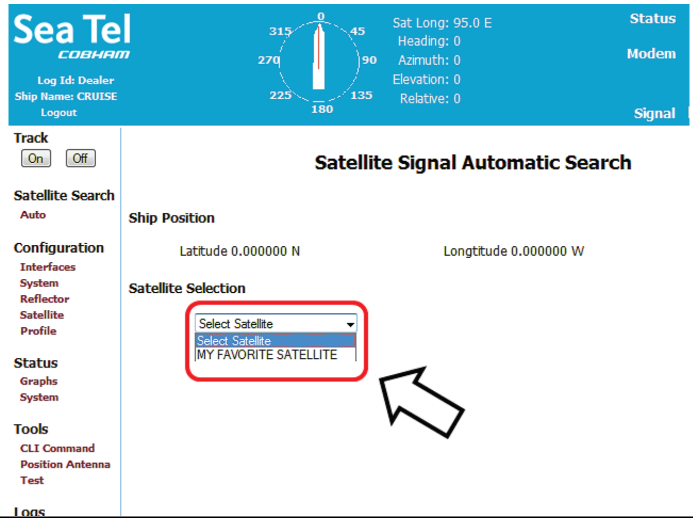
<table>
<tr><td>
6. Find the Latitude, Longitude and Heading displayed values. If they are correct skip to step 11.
</td><td>


</td></tr>
<tr><td>
7. If the Latitude & Longitude values are not correct, access the Communication Interfaces screen and enter the ships Latitude & Longitude position in the fields provided.
8. Click Save.
</td><td>


</td></tr>
<tr><td>
9. If the Heading value is correct, enter the correct value in the lower right field of the Communication Interfaces screen.
10. Click Save.
</td><td></td></tr>
<tr><td>
11. Check for blockage (this is the MOST common cause of not being able to acquire the desired satellite).
12. Verify that the correct satellite is selected.
13. Check for polarization drive failure.
14. Check for improper polarization alignment/position.
</td><td></td></tr>
<tr><td>
15. Check cable connections to assure that a cable has not been disconnected.
16. Check the modem for failure.
</td><td></td></tr>
</table>

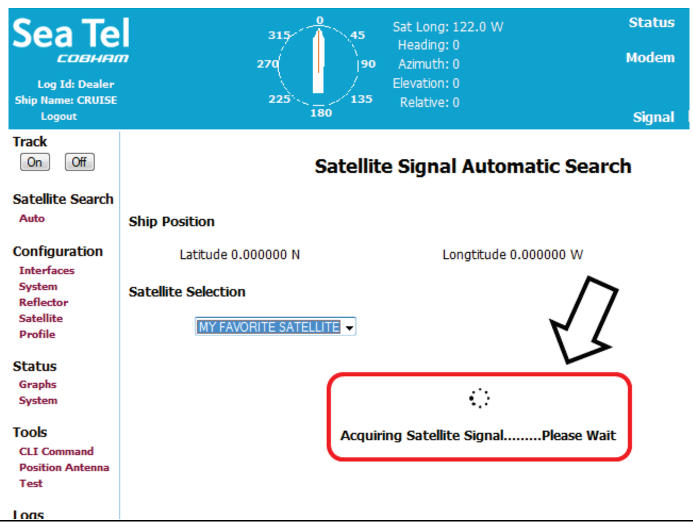
11.4. *To Target a different satellite*

1. To target a different satellite go to the Satellite Search Auto screen and select the desired satellite from the drop down list.



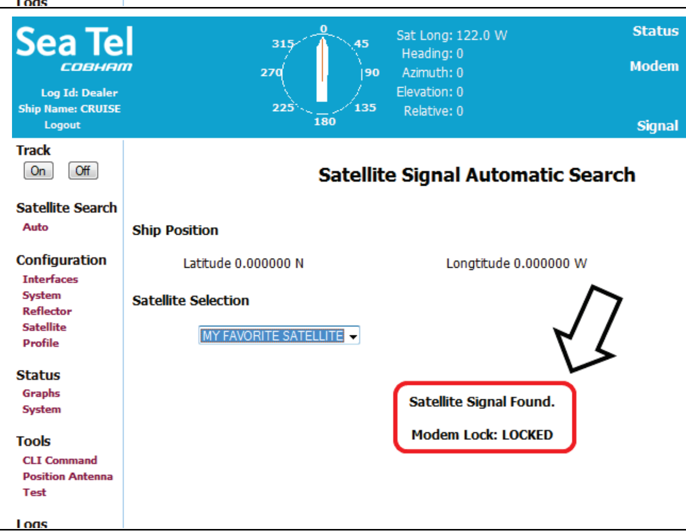
2. When you make that selection you will see the temporary message:

Acquiring Satellite Signal...Please Wait



3. Shortly after that you will see the temporary message:

Satellite Signal Found.
Modem Lock: LOCKED



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12. Optimizing Cross-Pol Isolation

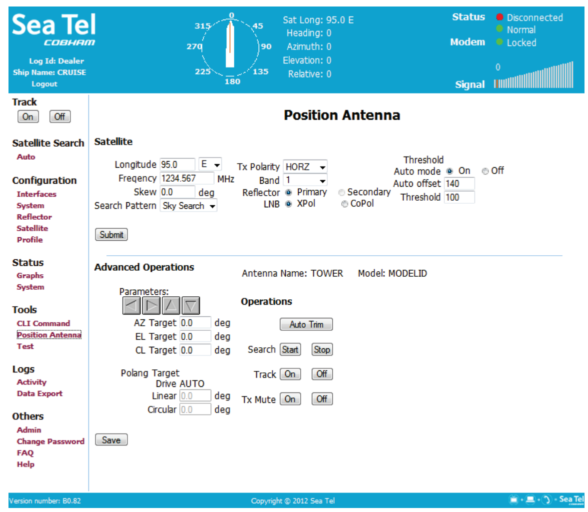
Now that all of the other setup items have been checked and changed as necessary, it is time to contact the NOC to arrange for cross-pol isolation testing and whatever other commissioning the NOC asks for. Read this procedure thoroughly before you are asked to begin. Assure that you are on the correct satellite and have RX network lock. (the NOC may have you adjust TX Frequency and/or modem TX level prior to beginning cross-pol isolation). At the appointed time follow the steps below for the cross-pol isolation testing.

12.1. Optimizing Cross-Pol Isolation

1. Access the Tools - Position Antenna screen.

NOTE: You will use Skew to optimize polarization because it drives the feed immediately (Linear Offset is slower, longer term drive).

2. Record the value in the Skew field in the upper section of the screen. If this satellite has a known Skew, it will be entered in the satellite configuration displayed here. If this satellite is not skewed this field will be 0.0.
3. While talking to the technician at the NOC make adjustments to the Skew value to adjust polarity of the feed under his/her direction (minus values are accepted – type a minus sign before the number value). It is best to adjust in one degree increments to get close to best isolation and then half degree steps and then tenths as needed. Click “Submit” after each numeric change is typed in.
4. Record the DIFFERENCE in Skew value which was required to achieve optimum cross-pol isolation.
5. Set Skew back to the value recorded in step 2.

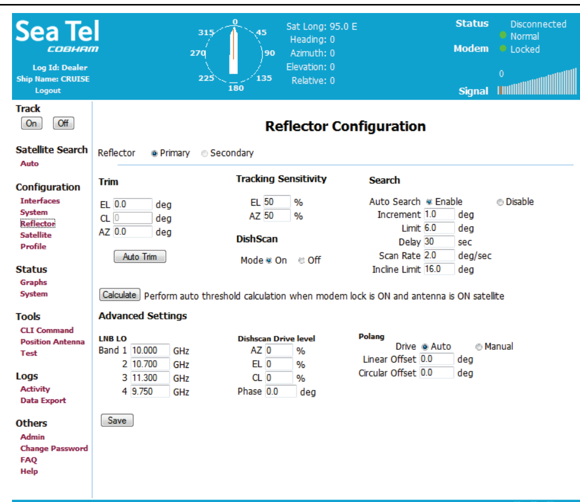


6. Access the Reflector Configuration screen.
7. Change the “Linear Offset” value by the amount of difference recorded in step 4.

Examples:

Skew was 0.0, you increased it to 2.5 to optimize TX polarization. You set Skew back to zero and go to the Reflector Configuration screen where you find Linear Offset to be 0.0, so you increase Linear Offset to 2.5 degrees and click Save.

Skew was 3.0, you decrease it to 1.0 to optimize TX polarization. You set Skew back to 3.0 and go to the Reflector Configuration screen where you find Linear Offset to be 0.0, so you set Linear Offset to minus 2 (-2.0) degrees and click Save.



8. Double check with the NOC to assure that cross-pol is still optimized. 9. Conduct any other testing as directed by the NOC (ie P1dB compression).	

13. 4012 GX Technical Specifications

The specifications of your antenna system are below. For Naval Engineering level information on this subject, please refer to Antenna Installation Guideline – Site Arrangement, document number 130040_A available on the Sea Tel Dealer Support Site.

13.1. 4012 Ku-Band Antenna Reflector

Type	Composite
Diameter (D)	1.06m (41.7 Inch)
TX Gain Ku-Band	40.8dBi @ 14.25GHz
RX Gain Ku-Band	39.8dBi @ 12.50GHz
System G/T Ku-Band (30° elevation, clear sky)	18.0dB/k (In Radome) (typical)

13.2. 4012 Ku-Band RF Cage

The RF Cage assembly is comprised of the feed, diplexer, BUC and LNBs.

13.2.1. Ku-Band Linear TXRX Feed Assy

Type	Center Focus Cassegrain feed with integral 9 GHz radar filter and Cross-Pol OMT
Cross Pol TX to RX Isolation:	>120 dB (on axis and within 1dB contour)
Co-Pol TX to RX Isolation	>90 dB
Polarization	Linear w/motorized skew adjustment
Polarization control	24 volt DC motor with pot feedback
Transmit Frequency Range	13.75-14.5GHz
Receive Frequency Range	10.70-12.75GHz
Polarization	Linear
Polarization Range of Motion	270 degrees
Co-Pol Diplexer	Integrated into RF Cage
Cross-Pol & Co-Pol LNBs	See LNB Specs

13.2.2. TX Radio Package

SSPB	Codan 8 Watt Mini 4908-W/E-DC/EX-CE-NI
Output Flange	WR-75
Input Connector	Type N
RF Output VSWR	1.5:1 max
RF Output Frequency Range	13.75-14.5 GHz
Input Frequency Range	950 to 1700 MHz
RF Port @ 1 dB GCP	39.0 dBm (8 Watt BUC)
Reference Frequency Level	-10 to +5 dBm
Reference Frequency	10 MHz ext
M&C Options	Ethernet, RS-422, USB
Step attenuator	1db Increments
Alarms	Lock, Over Temp, Temperature

13.2.3. SMW Quad Band LNB

Gain (typical)	54dB
Noise Figure	0.8dB
Current (typical)	270mA
LO Phase Noise (typical)	-75 dBc @ 1 KHz
	-75 dBc @ 10 KHz
	-105 dBc @ 100 KHz
	-120 dBc @ >1 MHz
LO Stability (over temp)	+/-10 or +/-25 KHz
LO Radiation	-60dBm
Image Rejection	40dB min
1db gain compression point (typical)	+15 dBm
IP 3 (typical)	+25 dBm
Output Connector	N Connector
Impedance	50 Ohm
Input Flange	WR-75
Band 1	
Voltage Required	13VDC
Input RF Frequency	10.95-11.70 GHz
Local Oscillator Frequency	10.00 GHz
Output IF Frequency	950 to 1700 MHz
Band 2	
Voltage Required	13VDC + 22 KHz Tone
Input RF Frequency	11.70-12.25 GHz
Local Oscillator Frequency	10.75 GHz
Output IF Frequency	950 to 1500 MHz
Band 3	
Voltage Required	18 VDC
Input RF Frequency	12.25-12.75 GHz
Local Oscillator Frequency	11.30 GHz
Output IF Frequency	950 to 1450MHz
Band 4	
Voltage Required	18VDC + 22 KHz Tone
Input RF Frequency	10.70-11.70 GHz
Local Oscillator Frequency	9.75 GHz
Output IF Frequency	950 to 1950 MHz
Gain (typ)	54dB

13.3. Integrated Control Unit (ICU)

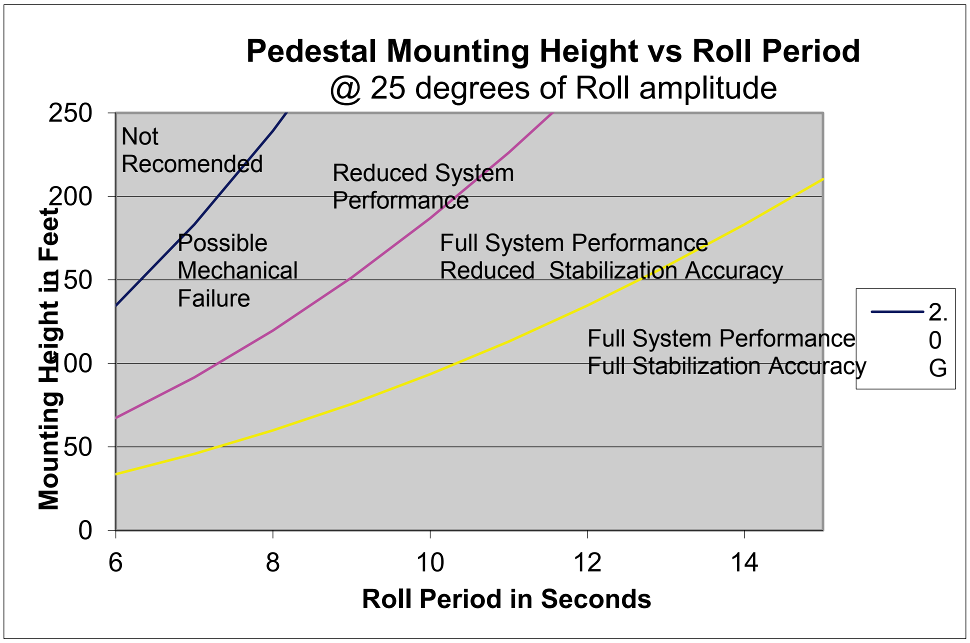
Connectors	
AC Power	100-240 VAC, 2A-1A
USB	Mini USB
GPS Input	RJ-11
Motor Control	DA-15S
Rotary Joint	SMA
L-Band	SMA Connector, L-Band Input
RF M&C	DE-9S
Feed	DB-25S
Service	DE-9S
Coax Switch	
LNB-A	N
LNB-B	N
Controls	Configurable from GUI
M&C Interface	Serial or Ethernet
Status LEDs	
ICU Status	Diagnostic Status of the ICU

13.4. Motor Driver Enclosure (MDE)

Connectors	
Drive	DA-15P
Home	DE-9S
Az	DA-15S
EL	DA-15S
CL	DA-15S
Status LEDs	
CL Drive	Yes
EL Drive	Yes
Az Drive	Yes
MDE Status	Yes

13.5. *Stabilized Antenna Pedestal Assembly*

Type:	Three-axis (Level, Cross Level and Azimuth)
Stabilization:	Torque Mode Servo
Stability Accuracy:	0.1° RMS, 0.2° peak in presence of specified ship motions (see below).
Azimuth Motor:	Size 23 Brushless DC Servo, Double Stacked w/ Encoder
Level and Cross Level Motors,	Size 23 Brushless DC Servo w/ Brake
Inertial Reference:	3 Solid State Rate Sensors
Gravity Reference:	2 MEMS Tilt Sensors
AZ transducer:	256 line optical encoder / home switch
Pedestal Range of Motion:	
Elevation Joint Angle	-15° to +115°
Cross Level (Inclined 30°)	+/- 35°
Azimuth	Unlimited
Elevation Pointing:	+5° to +90° at 20 degree roll only
	+10° to +85° at maximum combined roll & pitch
Relative Azimuth Pointing	Unlimited
Maximum Ship Motions	
Roll:	+/-25° at 8-12 sec periods
Pitch:	+/-15° at 6-12 sec periods
Yaw:	+/-8 degrees at 15-20 sec periods
Turning rate:	Up to 12 deg/sec and 15 deg/sec/sec
Headway:	Up to 50 knots
Heave	0.5G
Surge	0.2G
Sway	0.2G
Specified Ship Motion (for stability accuracy tests)	
Roll	+/- 20° at 8 second period
Pitch	10° Fixed
Az Relative	0, 45 and 90° with respect to roll input
Mounting Height	Sea Tel recommends that you not exceed tangential accelerations of 0.5G (See below chart)



13.6. GPS (integrated on Pedestal)

Waterproof	IPX7
Operating Temperature	-30˚C to +60˚C
Storage Temperature	-40˚C to +60˚C
Humidity	Up to 95% non-condensing or a wet bulb temperature of +35˚C
Altitude	-304m to 18,000m`
Vibration	IEC 60721
Max vehicle dynamics	500 m/s
Shock	50G 3ms
Connector	RJ11
Input Voltage	
Min	4.75VDC
Typ	5.0VDC
Max	5.25VDC
NMEA output messages	GGA, GLL
Refresh Rate	1s

13.7. Radome Assembly, 61”

Type	Frequency Tuned
Material	A sandwich
Size	
Diameter	1.54m (60.6 Inch)
Height	1.56m (61.7 Inch)
Hatch Size	0.43 x 0.66m (17 x 26 Inch) (min)
Weight	115 lbs (Empty)
RF attenuation (Ku Band)	Less than 0.4dB @ 10.7-14.50GHz dry
Wind:	Withstand relative average winds up to 56m/sec (125 MPH) from any direction.
Ingress Protection Rating	IP 56

13.1. 4012 Environmental Specifications (ADE)

13.1.1. Environmental Conditions (ADE)

Temperature Range (Operating)	-25º to +55º Celsius (-13º to +131º F)
Humidity	100% Condensing
Wind Speed	56 m/sec (125 mph)
Solar Radiation	1,120 Watts per square meter, 55º Celsius
Spray	Resistant to water penetration sprayed from any direction.
Icing	Survive ice loads of 4.5 pounds per square foot. Degraded RF performance will occur under icing conditions.
Rain	Up to 101.6mm (4 inches) per hour. Degraded RF performance may occur when the radome surface is wet.
Corrosion	Parts are corrosion resistant or are treated to endure effects of salt air and salt spray. The equipment is specifically designed and manufactured for marine use.

13.1.2. Chemically Active Substances

Environmental Condition	Test Level
Sea Salt	5 percent solution

13.1.3. Mechanical Conditions

Systematic Vibration	
Amplitude (single peak)	5.0 millimeters
Acceleration	2.0 G (20m/s2)
Frequency Range	1Hz-150Hz
Shock (Transient Vibration)	
Response Spectrum	I - II - III
Peak Accel., m/s2	100 - 300 - 500
Duration, ms	11 - 6 - 3
Number of Cycles	3 each direction
Directional Changes	6
Shock (Bump)	
Peak Accel., m/s2	250
Duration, ms	6
Number of Cycles	100 ea. direction
Directional Changes	6

13.1.4. Transit Conditions

Drop (Transit Shock)	Complies with ISTA Standard

13.2. Media Xchange Point ™

13.2.1. Ship's Terminal Interface (MXP)

Standard 19 Inch Rack mount	One Unit High (Slide Rails optional)
Physical Dimensions	43.18 x 43.18 x 4.45 (cm) / 17 X 17 X 1.75 (Inches)
Input Voltage	110-240 VAC, 47-63 Hz, single phase
Weight	3.0 kgs / 6.6lbs
Synchro Interface	
Connectors	5 screw terminal connections (Plug-In)
Input Voltage Level	36-110 VDC, 400 or 60 Hz
Synchro Ratios	1:1, 36:1, 90 or 180:1 and 360:1 with Synchro-Digital converter
Impedance	1M ohm
SBS Interface	
Connectors	4 screw terminal connections (Plug-In)
Input Voltage Level	20-90 VDC
Interface	Opto-isolated
Polarity	Auto switching
Ratio	6 steps per degree
Impedance	10K Ohm

13.2.2. MXP Box Rear Panel Connections

4 Ethernet Port (RJ-45)
1 Ethernet Port Internal (RJ-45)
1 Power Input
1 SMA Connector (RX from Rotary Joint to Diplexer)
1 F-Connector from Diplexer to Modem RX Port
8 Tri Colored MXP status LEDs
Small Form Factor Pluggable
USB Devise (Mini B)
USB Host (Type A) (Under Development)
2 RS-232 Serial Pass thru Ports (1 Port has the ability to monitor receiver lock and drive transmit mute for Sat Modem)
1 NMEA RS-232 Serial Port
1 RS-232 Console Port
1 Internal Facing RS-232 Port
SBS/Synchro Gyro (Terminal Connections)(Plug-In)
Modem and OBM I/O Port
Aux IN1
Aux IN2
SW1
SW2
SW3-A
SW3-B
SW4-A
SW4-B

13.2.3. Integrated SCPC Receiver

Tuning Range	950 to 1950 MHz in 1 KHz increments
Input RF Level	-85 to -25dBm typical
Output RF Level	Input level +/- 1dB typical
Sensitivity	30mV/dB typical (25 counts/dB typical)
Bandwidth (3dB)	150 KHz
Interfaces	
Modem/MXP M&C Interface	OpenAMIP & Legacy
Network Interface	4-port managed fast ethernet switch
User Interface	Web Browser/Console Port

13.2.4. Control Interface

External AGC	
Connectors	2 screw terminal connections
Input Voltage Level	0-5 VDC
Impedance	30K Ohm
Control (Logic Sense can be reversed by adding 128 to the system type)	Low Level (<1.25VDC)= Modem Lock
	High Level (>1.25 VDC)= Modem Unlock
Switched outputs	4.7K pull up or Pull Down
Dry Contacts: 2 Each	Normally Open

13.2.5. SW1 Local Band Select Output

Connections	1 screw terminal connection (SW1)
Control Level	Low Band=OPEN circuit
	High Band=SHORT to ground
	Controlled by MODE - TRACKING - Band Selection
	Current sink of 0.5 amps max.

13.2.6. SW2 Blockage/ TX Mute Output

Connections	1 screw terminal connection (SW2)
Control Level	Not Blocked or Not mispointed=OPEN circuit
	Blocked or mispointed= SHORT to ground
	Current sink of 0.5 amps max.

13.2.7. NMEA Interface

Connections	5 screw termninal connections (RXA+ /RXA- input, RXB+/ RXB- input, and TXA+ output)
Rx Sentence Format	Global Positioning System
	$xxGLL,DDmm,mmmm,N,DDDmm.mmmm,W (UTC optional) (*CS optional)
	Heading $xxHDT,xxx.x
Tx Sentence Format	Global Positioning System
	$GPGGA,0,DDmm,N,DDDmm,W

NMEA string examples:

RX:

$GPGLL,3800.4300,N,12202.6407,W,231110,A*32

$GPGGA,231110,3800.4300,N,12202.6407,W,2,08,1.2,40.0,M,-31.3,M,,*4A

TX:

$GPRMC,231325,A,3800.4300,N,12202.6405,W,000.0,184.9,190412,014.1,E*67

$GPVTG,184.9,T,170.8,M,000.0,N,0000.0,K*74

13.2.8. ICU/Pedestal Power Supply

Voltage	24VDC
Wattage	150W
Current Capacity	6.5A

13.2.9. BUC Power Supply

Voltage	24VDC
Wattage	150W
Current Capacity	6.5A

13.3. BDE Environmental Conditions

Temperature	0 to 40 degrees C
Humidity	Up to 100% @ 40 degrees C, Non-Condensing

13.4. System Weight (ADE)

System Weight (Pedestal & Radome)	152kg/335lbs

13.5. Power Requirements

ADE	110-240 VAC, 47-63 Hz, single phase, 300 Watts MAX (brake release, pedestal drive and 8W BUC drive)
BDE	110-240 VAC, 47-63 Hz, single phase, 100 Watts

13.6. Regulatory Compliance

Operational Shock and Vibration	Operational: IEC-60945, Survival: IEC-60721 and MIL-STD 901D
EMI/ EMC Compliance	EN 301-489, EN 301-428, EN 302-340 (Ku Band)
Safety Compliance	ETSI EN 60950
Environmental Compliance	RoHS
FCC ESV Compliance Ku-Band	47 C.F.R. § 25.222
FCC ESV Compliance Ka-Band	TBD

13.7. *Cables*

13.7.1. Antenna L-Band IF Coax Cables (Customer Furnished)

Due to the loss across the length of the RF coaxes at L-Band, Sea Tel recommends the following 50 ohm coax cable types (and their equivalent conductor size) for our standard pedestal installations. Type N male connectors installed on the cables MUST be 50 Ohm connectors for the center pin to properly mate with the female adapters we provide on the Base multiplexer panel and on the adapter bracket mounted inside the radome next to the breaker box.:

Run Length	Coax Type	Typical. Loss @ 1750Mhz	Shield isolation	Center Conductor Size	Installed Bend Radius	Tensile Strength
<100 ft	LMR-240	10.704 db per 100 ft(30.48 m)	>90db	0.056 In. (1.42 mm)	2.5 In. (63.5 mm)	80lb (36.3 kg)
up to 150 ft	LMR-400	5.571 db per 100 ft(30.48 m)	>90db	0.108 In. (2.74 mm)	4.0 in. (101.6 mm)	160lb (72.6 kg)
up to 200 ft	LMR-500	4.496 db per 100 ft(30.48 m)	>90db	0.142 In. (3.61 mm)	5.0 In. (127 mm)	260lb (118 kg)
Up to 300 ft	LMR-600	3.615 db per 100 ft(30.48 m)	>90db	0.176 In. (4.47 mm)	6.0 In. (152.4 mm)	350lb (158.9 kg)

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14. DRAWINGS

14.1. *4012 GX Ku-Band Model Specific Drawings*

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SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	133373-1	A	PCB ASS'Y, MXP-2011	
2	1 EA	133729-5	A	POWER SUPPLY SWITCHING, 75W	
3	1 EA	122660-6	A	HARNESS, AC ENTRY, 18 IN. CHASSIS	
4	1 EA	126597-17	B3	CABLE ASS'Y, .156 ORG IDC TO PIN TERM	(NOT SHOWN) (P/S DC TO J106)
5	1 EA	135558-1	A	RECEPTACLE ASS'Y, M12 (M) TO IDC-5, 1	(J115 TO J15)
6	2 EA	129751-6	A1	CABLE ASS'Y, RIBBON, DE-9P TO 10 PIN	(J113 TO J13/J114 TO J14)
7	1 EA	135762-1	A	CABLE ASS'Y, JUMPER, M-F, 0.1 IN., 15	(NOT SHOWN) (J104 TO FP)
8	1 EA	119673	B	SWITCH, ROCKER, DPST, 10A	
10	1 EA	134727-1	A	FRONT PANEL, MXP	
11	1 EA	134951-1	A	BACK PANEL, MXP	
12	1 EA	134726-1	A	ENCLOSURE TOP, MXP	
13	1 EA	134724-1	A1	ENCLOSURE BASE, MXP	
14	1 EA	135479-1	A	BRACKET, POWER SUPPLY, MXP, 11G2	
15	1 EA	120385-3	B1	BRACKET, LID, ACU ASS'Y, M3 PEM	
19	1 EA	136865	A	LABEL, MXP, CONNECTOR PINOUTS, J11 -	
20	1 EA	130091-1	A	LABEL, TAMPER RESISTANT, WARRANTY VOI	
21	4 EA	125201-1	A	CABLE CLAMP, NYLON, 3/16 DIA, ADHESIV	
30	1 EA	108929-2	D	POWER CORD, 110V AC	PL C1 B2 MXP_Box AntSys_Crate
30	1 EA	108929-2	D	POWER CORD, 110V AC	(NOT SHOWN)
30	1 EA	108929-2	D	POWER CORD, 110V AC	PL C1 B1 BDE_Kit_Box AntSys_Crate
31	1 EA	109752-3	C	POWER CORD, 220V AC	(NOT SHOWN)
31	1 EA	109752-3	C	POWER CORD, 220V AC	PL C1 B2 MXP_Box AntSys_Crate
31	1 EA	109752-3	C	POWER CORD, 220V AC	PL C1 B1 BDE_Kit_Box AntSys_Crate

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ENCLOSURE ASS'Y, MXP

PROD FAMILY	EFF. DATE		DRAWING NUMBER	REV
COMMON	5/3/2012	SHT 1 OF 2	134725-1	A2

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
40	6 EA	110941-3	B	SCREW, JACK, 4-40 X .312 LG	
50	2 EA	120077-112		SCREW, FLAT HD, PHIL, M3 X 4, S.S.	
51	12 EA	120077-116		SCREW, FLAT HD, PHIL, M3 X 6, S.S.	
52	15 EA	119745-116		SCREW, PAN HD, PHIL, M3 x 6, S.S.	
53	2 EA	119745-122		SCREW, PAN HD, PHIL, M3 X 12	
58	12 EA	114580-210		WASHER, FLAT, M3, S.S.	
59	7 EA	120089-211		NUT, HEX, M3, S.S.	
67	1 EA	126264-13	A1	WASHER, STAR, INTERNAL TOOTH, NARROW	
69	1 EA	119967	A1	NUT, HEX, PANEL, 3/8-32	
70	1 EA	135577	B0.8 3	SOFTWARE, IMA	

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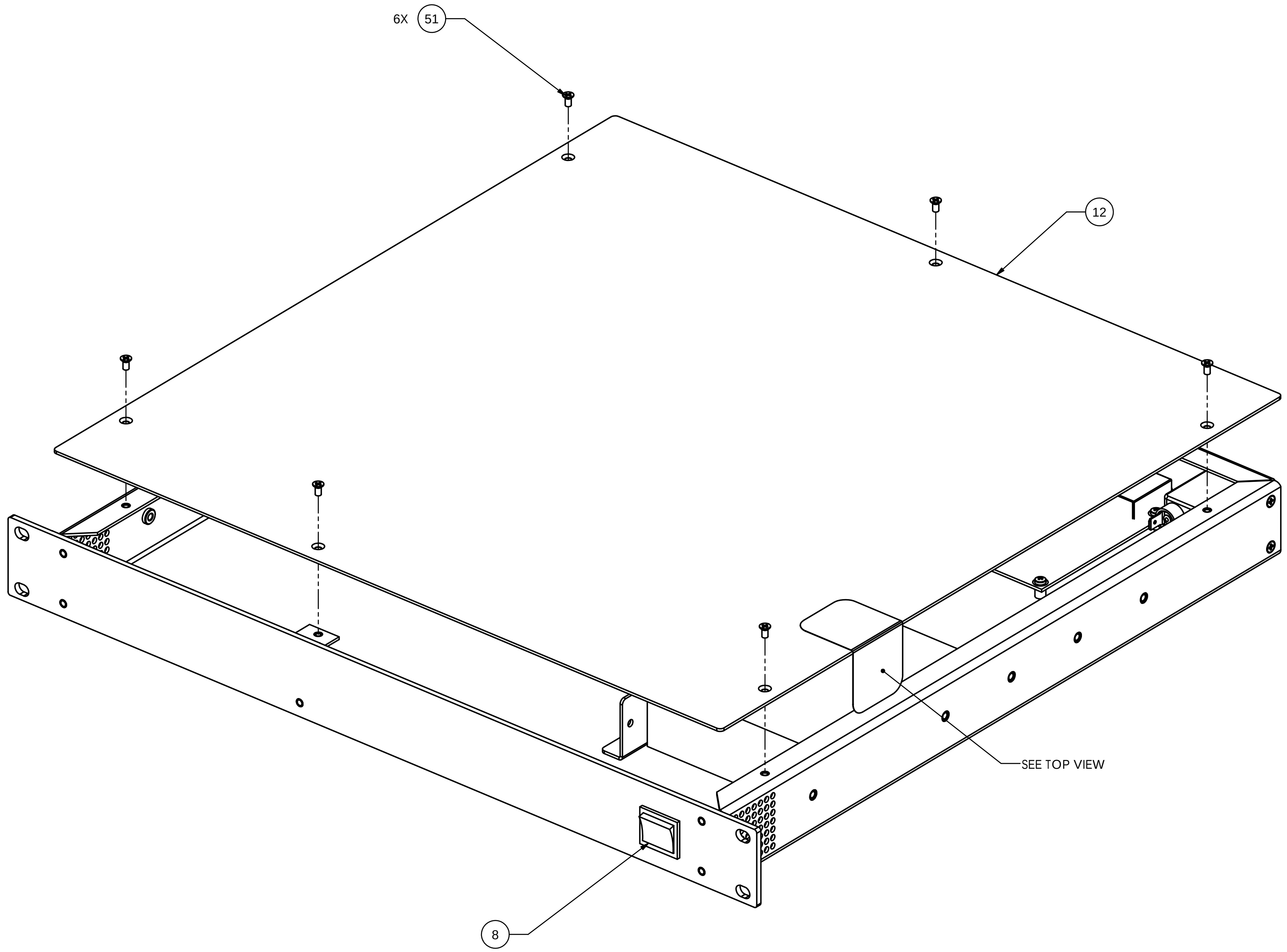
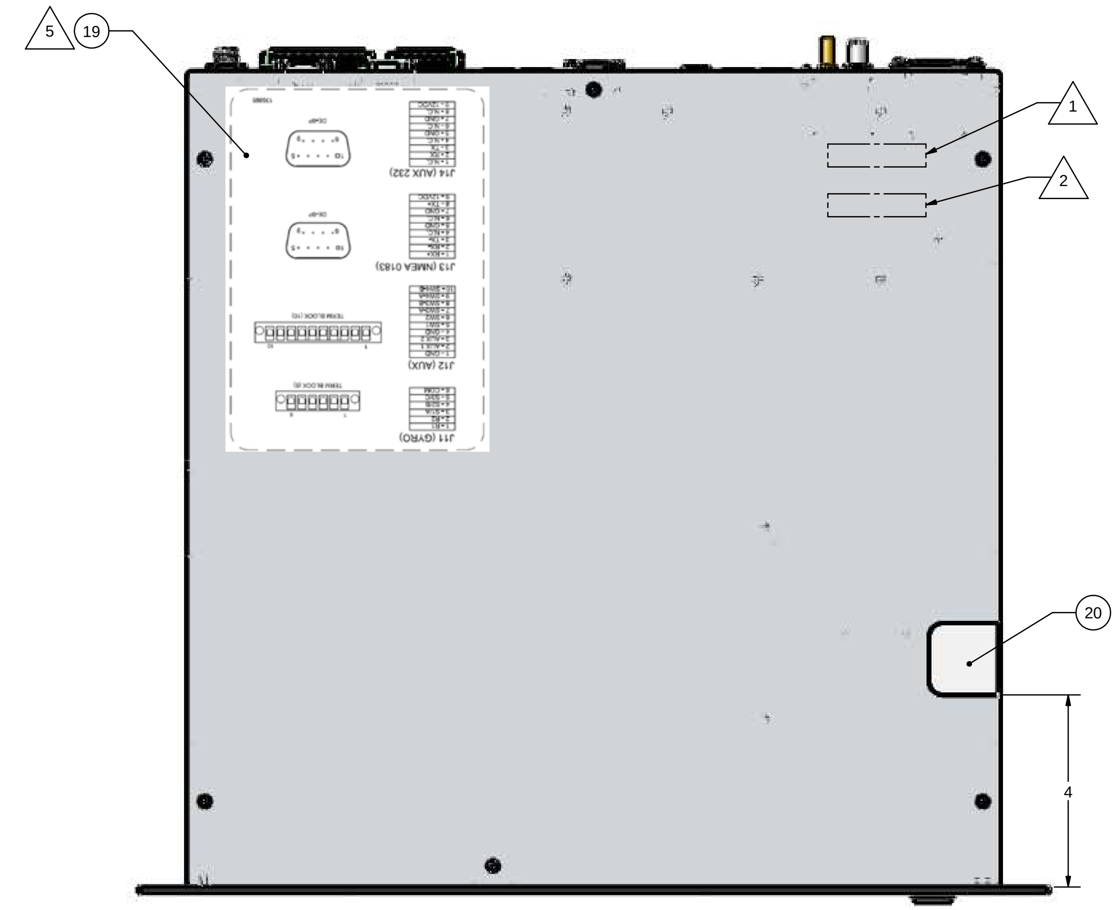
ENCLOSURE ASS'Y, MXP

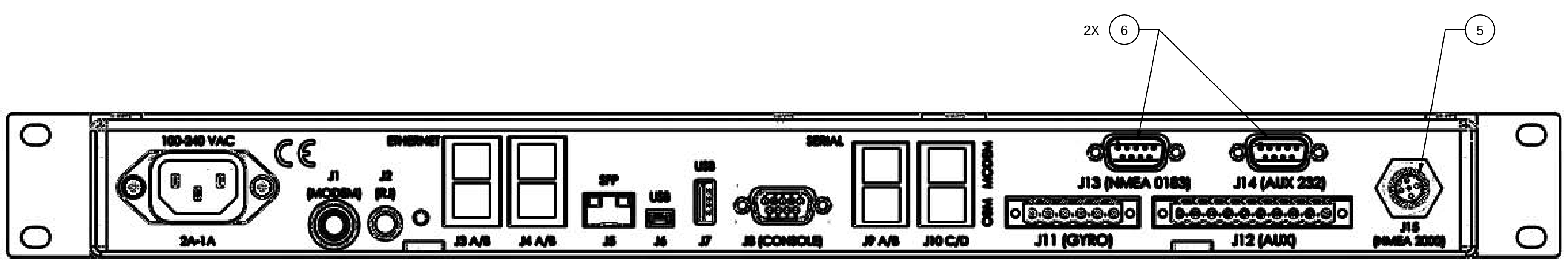
PROD FAMILY COMMON	EFF. DATE 5/3/2012	SHT 2 OF 2	DRAWING NUMBER 134725-1	REV A2

REV	ECO#	DATE	DESCRIPTION	BY
A	9458	3-8-12	ADD ITEM 19, NOTE 6; RELEASED TO PRODUCTION, WAS X5	K.D.H.
A1	9465	3-28-12	REMOVE NOTE REQUIRING TESTING PER 136596	K.D.H.
A2	9469	4-26-12	ADDED SOFTWARE P/N TO THE BOM AS BUILT.	MSF

REVISION HISTORY







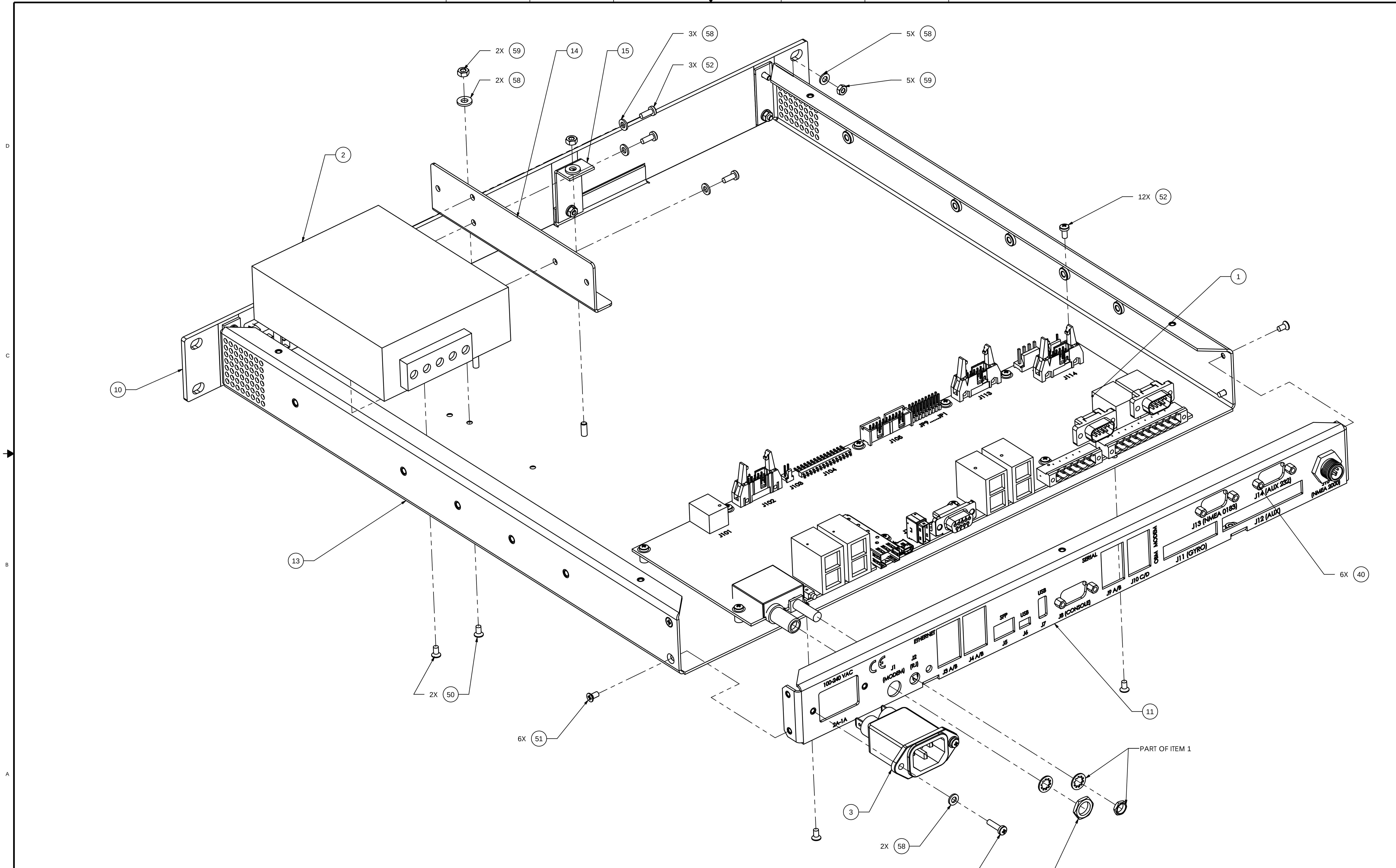
REFERENCE DRAWINGS

135494 SCHEMATIC, ENCLOSURE ASS'Y, MXP-2011

NOTES: UNLESS OTHERWISE SPECIFIED

1. IDENTIFY ASS'Y P/N & S/N PER SEA TEL SPEC. 122930 APPROX. WHERE SHOWN.
2. IDENTITY PCB ASSY P/N & S/N PER SEA TEL SPEC 122930 APPROX WHERE SHOWN.
3. MANUFACTURE PER SEA TEL STANDARD 122298.
4. COSMETIC INSPECTION PER SEA TEL SPEC 127212.
5. NOTE ORIENTATION.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 ANGLES: ±.5° INTERPRET TOLERANCING PER ASME Y14.5 - 2009	DESIGNER/ENGINEER: MMALEK	DRAWN BY: MMALEK	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986
	WEIGHT: 10.934 LB	DRAWN DATE: 8/8/11	
	MATERIAL: N/A	APPROVED BY:	TITLE: ENCLOSURE ASS'Y, MXP
	FINISH: N/A	APPROVED DATE:	
Sea Tel - Strictly Confidential & Proprietary. Do Not Copy, Distribute or Disclose Without Prior Written Approval From Sea Tel.	SURFACE ROUGHNESS:	SIZE: B SCALE: 2:3	DRAWING NUMBER 134725 REV A2
Copyright © Sea Tel, Inc 2011 - Unpublished Work	3rd ANGLE PROJECTION	FIRST USED: 4012GX	SHEET NUMBER 1 OF 2



SIZE	SCALE:	DRAWING NUMBER	REV
D	1:1	134725	A2
		SHEET NUMBER	2 OF 2

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	134803-1	A	GENERAL ASS'Y, 4012GX	PL C1 AntSys_Crate
2	1 EA	135006-1	A1	RADOME ASS'Y, GA INSTALL, 61 IN, TX/R	PL C1 SN AntSys_Crate
3	1 EA	132345-1	A1	SSPB, KU, 8W, CODAN MINI BUC, FULL-BA	PL C1 I1 SN w/134803-1,1 AntSys_Crate
4	2 EA	136128-2	B	LNB, SMW, QUAD LO, KU BAND, TYPE N	PL C1 I1 SN w/134803-1,2 AntSys_Crate
5	1 EA	134725-1	A2	ENCLOSURE ASS'Y, MXP	(NOT SHOWN)
5	1 EA	134725-1	A2	ENCLOSURE ASS'Y, MXP	PL C1 B2 SN MXP_Box AntSys_Crate
6	1 EA	134563-1	A	BELOW DECK KIT, 4012GX (MXP)	PL C1 B1 BDE_Kit_Box AntSys_Crate
8	1 EA	135003	X1	CUSTOMER DOC PACKET, 4012GX	PL C1 B1 BDE_Kit_Box AntSys_Crate
8	1 EA	135003	X1	CUSTOMER DOC PACKET, 4012GX	(NOT SHOWN)
9	1 EA	124747-3	C	DECAL KIT, SEATEL, 61 IN DOMES	(NOT SHOWN)
10	1 EA	121711	A	BALANCE WEIGHT KIT	(NOT SHOWN)
10	1 EA	121711	A	BALANCE WEIGHT KIT	PL C1 AntSys_Crate
10	1 EA	121711	A	BALANCE WEIGHT KIT	PL C1 B1 BDE_Kit_Box AntSys_Crate
11	1 EA	131564-1	A	SHIP STOWAGE KIT, XX10	(NOT SHOWN)

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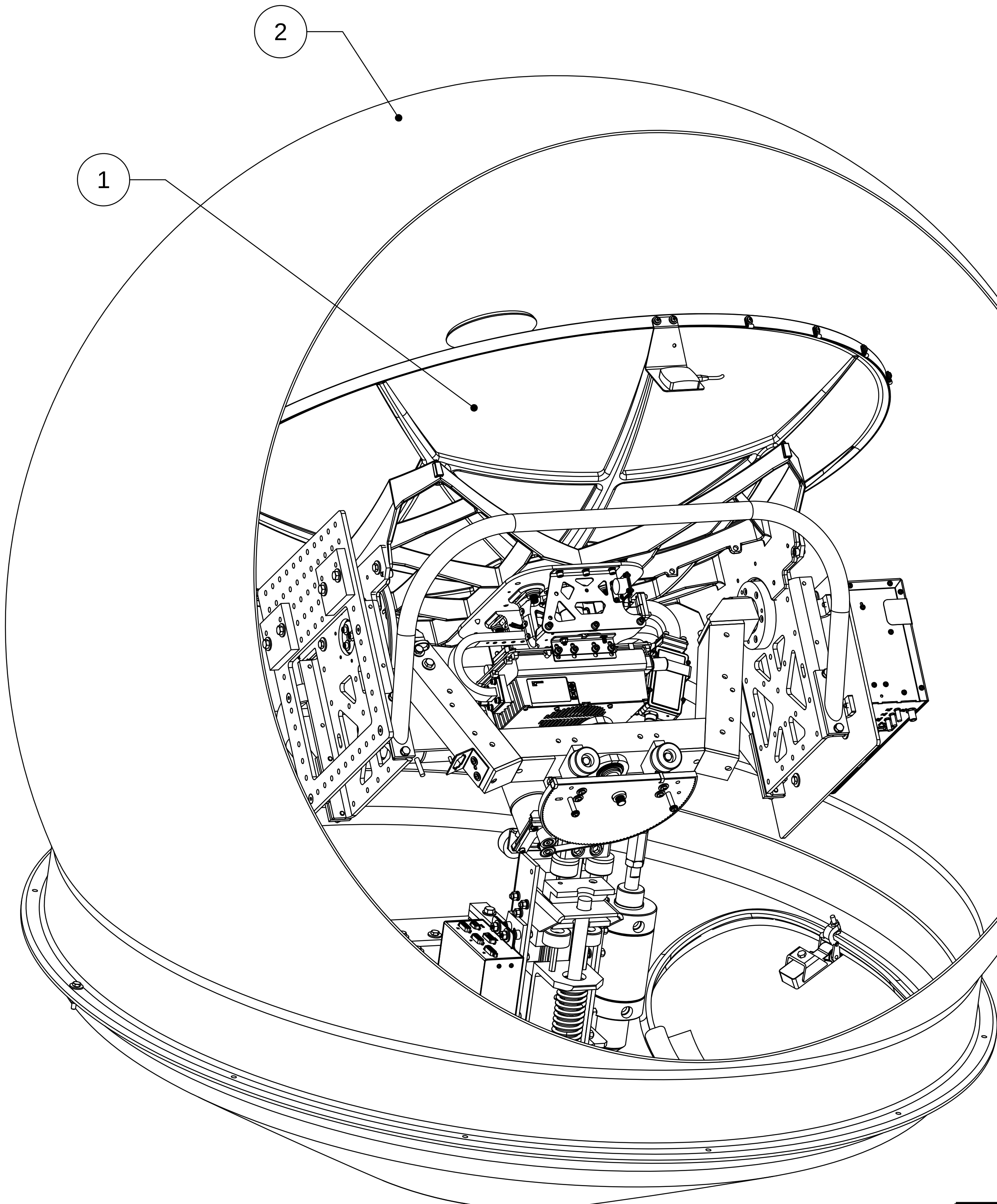
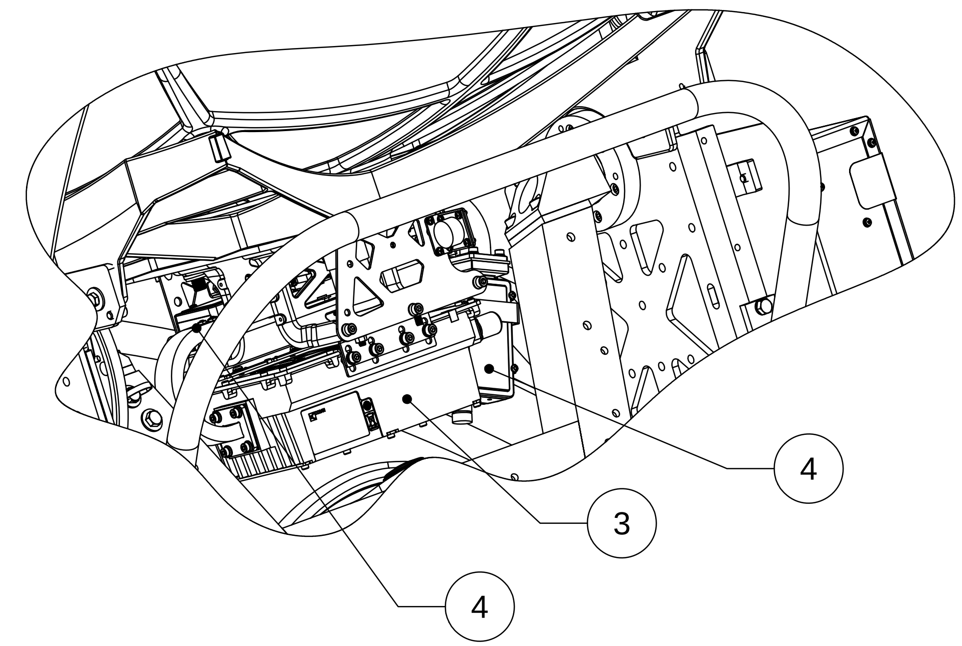
SYSTEM, 4012 GX, 8W, 61 IN, STD				
PROD FAMILY 4012GX	EFF. DATE 5/3/2012	SHT 1 OF 2	DRAWING NUMBER 134968-601	REV A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	9465	3-30-12	RELEASED TO PRODUCTION, WAS X5	K.D.H.





REFERENCE DRAWINGS;
134639 SYSTEM BLOCK DIAGRAM
134640 ANTENNA SYSTEM SCHEMATIC

NOTES: UNLESS OTHERWISE SPECIFIED

1. MANUFACTURE PER SEATEL STANDARD 122298.
2. RECORDED WEIGHTS ARE THE ACTUAL MEASURED WEIGHTS OF SYSTEM AS ORDERED. FOR SYSTEM LIFTING AND MOUNTING CUSTOMER SHALL FOLLOW LOCAL SAFETY CODES.

SYSTEM WEIGHTS 2.					
DASH	GA	RADOME	BASE FRAME	AC KIT	SYSTEM TOTAL
601	TBD	TBD	N/A	N/A	TBD

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.

X.X = ±.050
X.XX = ±.020
X.XXX = ±.005
ANGLES: ±.5°

INTERPRET TOLERANCING PER ASME Y14.5 - 2009

DESIGNER/ENGINEER: T.E.	DRAWN BY: K.D.H.
WEIGHT:	DRAWN DATE: 7-8-11
MATERIAL: N/A	APPROVED BY:
FINISH: N/A	APPROVED DATE:
SURFACE ROUGHNESS:	SIZE: B / SCALE: 1:8
3rd ANGLE PROJECTION	FIRST USED: 4012 GX

Sea Tel
COBHAM
Tel. 925-798-7979 Fax. 925-798-7986

TITLE: SYSTEM, 4012 GX

DRAWING NUMBER: 134968

REV: A

SHEET NUMBER: 1 OF 1

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	134803-1	A	GENERAL ASS'Y, 4012GX	
2	1 EA	134512-1	C	ANTENNA ASS'Y, 4012GX, KU	
5	2 EA	136128-2	B	LNB, SMW, QUAD LO, KU BAND, TYPE N	
6	1 EA	132345-1	A1	SSPB, KU, 8W, CODAN MINI BUC, FULL-BA	
20	1 EA	132956-1	C	CIRCUIT BREAKER BOX ASS'Y, 6 AMP	
21	1 EA	134735-1	B	ENCLOSURE ASS'Y, ICU	
22	1 EA	131227-1	C	ENCLOSURE ASS'Y, MOTOR DRIVER, 09G2	
23	1 EA	121951-3	F1	MOTOR, SZ 23, BLDC, 2 STK W/ ENCODER,	
24	2 EA	125644-1	G	MOTOR, SIZE 23, BLDC W/ BRAKE, 15 PIN	
26	1 EA	131381-1	C	GPS ANTENNA, SERIAL	
27	1 EA	129543-24	C	KIT, CABLE ASS'Y AND PROXIMITY SENSOR	
31	1 EA	129526-84	B	HARNESS ASS'Y, PCU TO MOTOR DRIVER, X	
32	1 EA	129527-36	B	HARNESS ASS'Y, MOTOR TO ELEVATION, 36	
33	1 EA	135416-48	A	HARNESS ASS'Y, REFLECTOR, 48 INCH, DB	
34	1 EA	135853-48	A	CABLE ASS'Y, DC POWER, ICU TO CODAN M	
40	1 EA	134074-1	A	POWER RING, 41.6MM, 3 CIRCUITS, 20A	
41	1 EA	135832-84	A	CABLE ASS'Y, AC POWER, SHIELDED, IEC	
51	2 EA	114972-4	N	CABLE ASS'Y, SMA(M) - SMA(M), 30 IN	
52	1 EA	114972-2	N	CABLE ASS'Y, SMA(M) - SMA(M), 72 IN	
53	1 EA	123758-7	B1	CABLE ASS'Y, SMA(M)-N(M) 90 DEG, 7 FT	
55	1 EA	123758-5ORG	B1	CABLE ASS'Y, SMA(M)-N(M) 90 DEG, 5 FT	(X-POL)
56	1 EA	123758-5YEL	B1	CABLE ASS'Y, SMA(M)-N(M) 90 DEG, 5 FT	(CO-POL)
60	2 EA	115492-1	C7	ADAPTER, N(F)-SMA(F), W/FLANGE	
61	1 EA	116466	F1	ROTARY JOINT, 4.5 GHz, DUAL COAX.	
100	1 EA	134725-1	A2	ENCLOSURE ASS'Y, MXP	
101	1 EA	134563-1	A	BELOW DECK KIT, 4012GX (MXP)	
103	1 EA	111115-6	B1	CABLE ASS'Y, F(M)-F(M), 6 FT.	
104	1 EA	111079-6	G1	CABLE ASS'Y, SMA(M)-N(M), 6 FT.	

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SYSTEM BLOCK DIAGRAM, 4012 GX, KU

PROD FAMILY	EFF. DATE		DRAWING NUMBER	REV
LIT	5/3/2012	SHT 1 OF 2	134639-1	A

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
105	2 EA	119479-10	B1	CABLE ASS'Y, CAT5 JUMPER, 10 FT.	
106	1 EA	119478-5	D	CABLE ASS'Y, RJ-45 SERIAL, 60 IN.	
108	1 EA	133287-2	A1	CABLE ASS'Y, USB 2.0, 6FT, A/M TO MIN	
110	1 EA	120643-25	B	CABLE ASS'Y, RS232, 9-WIRE, STRAIGHT,	
120	1 EA	116700-6	F	CABLE ASS'Y, RG223, N(M)-F(M), 6 FT.	
121	2 EA	110567-19	C1	ADAPTER, N(F)-N(F), STRAIGHT, FLANGE	
126	1 EA	135689-6	A	CONN, PHOENIX, PLUGGABLE, TERM BLOCK,	
127	1 EA	135689-10	A	CONN, PHOENIX, PLUGGABLE, TERM BLOCK,	
128	1 EA	136897	A	CONNECTOR, DE9 (F) - TERM. BLOCK	

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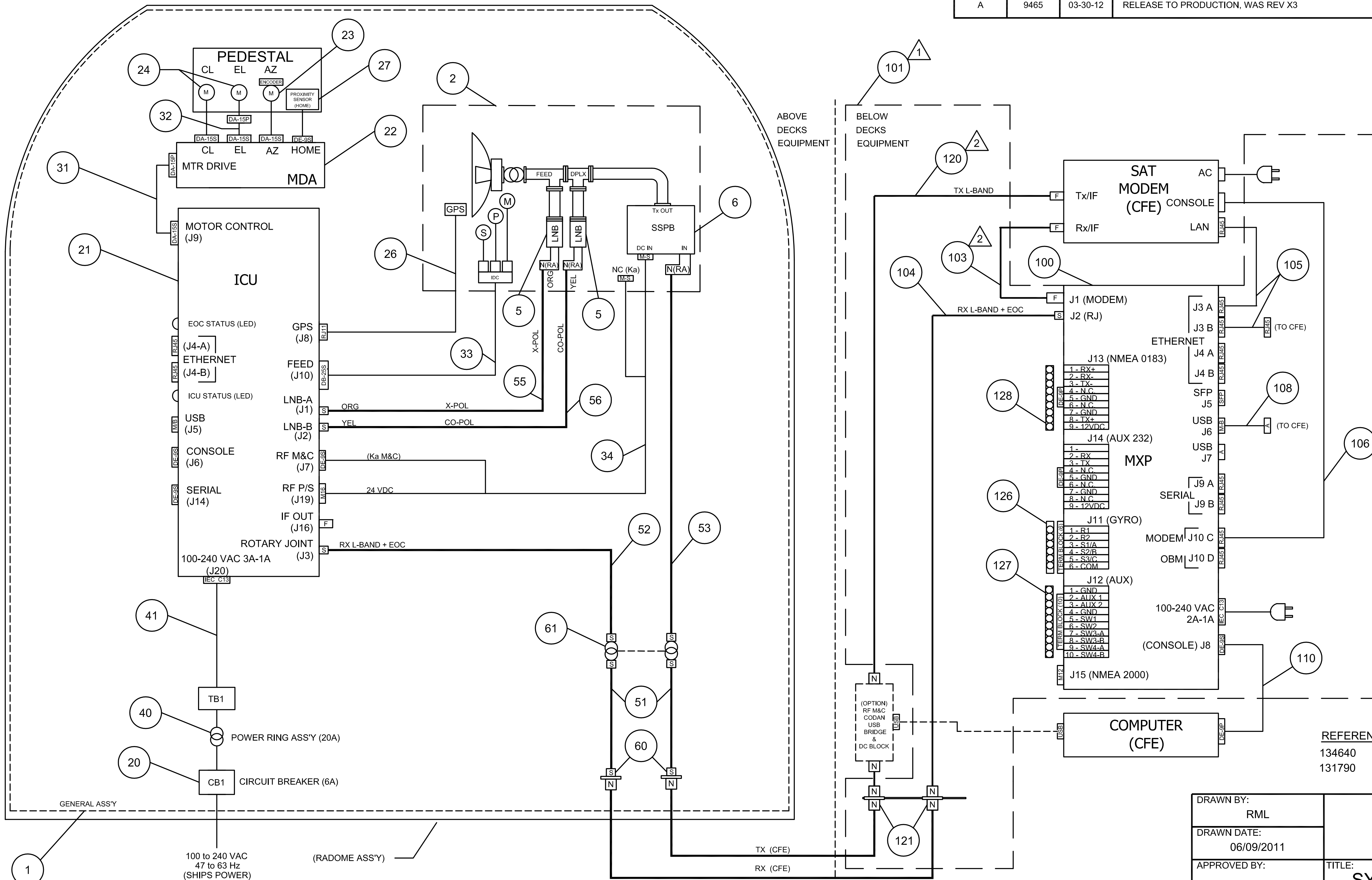
SYSTEM BLOCK DIAGRAM, 4012 GX, KU

PROD FAMILY	EFF. DATE		DRAWING NUMBER	REV
LIT	5/3/2012	SHT 2 OF 2	134639-1	A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	9465	03-30-12	RELEASE TO PRODUCTION, WAS REV X3	HT



DASH 1	KU	SHEET 1
DASH 2	KA	SHEET 2

REFERENCE DRAWINGS:

134640 ANTENNA SYSTEM SCHEMATIC
131790 ANTENNA PEDESTAL SCHEMATIC, XX09

4012 GX, KU CONFIGURATION

NOTES (UNLESS OTHERWISE SPECIFIED):

1. BELOW DECK KIT DOES NOT INCLUDE MXP ASSEMBLY.
2. REFER TO BELOW DECK KIT DOCUMENTATION FOR ALTERNATE CONFIGURATIONS.

DRAWN BY:	RML
DRAWN DATE:	06/09/2011
APPROVED BY:	
APPROVED DATE:	
TITLE:	SYSTEM BLOCK DIAGRAM 4012 GX
SIZE	B
SCALE:	NONE
DRAWING NUMBER	134639
REV	A
FIRST USED:	HINT
SHEET NUMBER	1 OF 2

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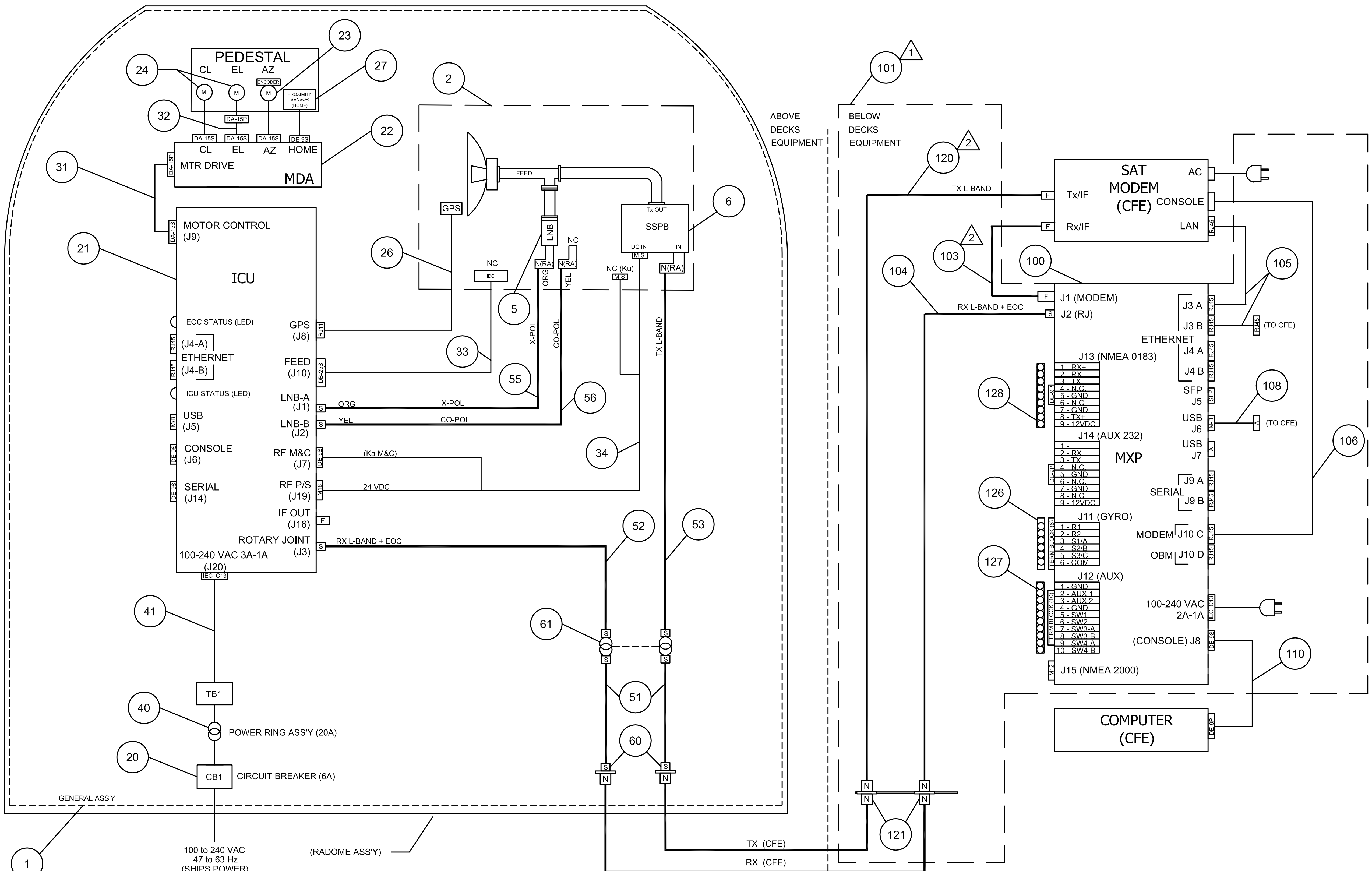
Tel. 925-798-7979 Fax. 925-798-7986



4012 GX, KA CONFIGURATION

NOTES (UNLESS OTHERWISE SPECIFIED):

1. BELOW DECK KIT DOES NOT INCLUDE MXP ASSEMBLY.
2. REFER TO BELOW DECK KIT DOCUMENTATION FOR ALTERNATE CONFIGURATIONS.

SIZE	SCALE:	DRAWING NUMBER:	REV:
B	NONE	134639	A
			SHEET NUMBER: 2 OF 2

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
3	1 EA	111115-6	B1	CABLE ASS'Y, F(M)-F(M), 6 FT.	
4	1 EA	111079-6	G1	CABLE ASS'Y, SMA(M)-N(M), 6 FT.	
5	2 EA	119479-10	B1	CABLE ASS'Y, CAT5 JUMPER, 10 FT.	
6	1 EA	119478-5	D	CABLE ASS'Y, RJ-45 SERIAL, 60 IN.	
7	1 EA	126877	C1	HARNESS ASS'Y, COMTECH MODEM INTERFAC	
8	1 EA	133287-2	A1	CABLE ASS'Y, USB 2.0, 6FT, A/M TO MIN	
10	1 EA	120643-25	B	CABLE ASS'Y, RS232, 9-WIRE, STRAIGHT,	
20	1 EA	116700-6	F	CABLE ASS'Y, RG223, N(M)-F(M), 6 FT.	
21	1 EA	136872	A	BRACKET ASS'Y, CONNECTOR, RACK MOUNT	
23	1 EA	114973-72	E1	CABLE ASS'Y, N(M)-N(M), 72 IN.	
24	1 EA	136489	A	POWER CORD, 36", IEC TO 110VAC	(NOT SHOWN)
25	1 EA	136490	A	POWER CORD, 36", IEC TO 220VAC	(NOT SHOWN)
26	1 EA	135689-6	A	CONN, PHOENIX, PLUGGABLE, TERM BLOCK,	
27	1 EA	135689-10	A	CONN, PHOENIX, PLUGGABLE, TERM BLOCK,	
28	1 EA	136897	A	CONNECTOR, DE9 (F) - TERM. BLOCK	

Sea Tel
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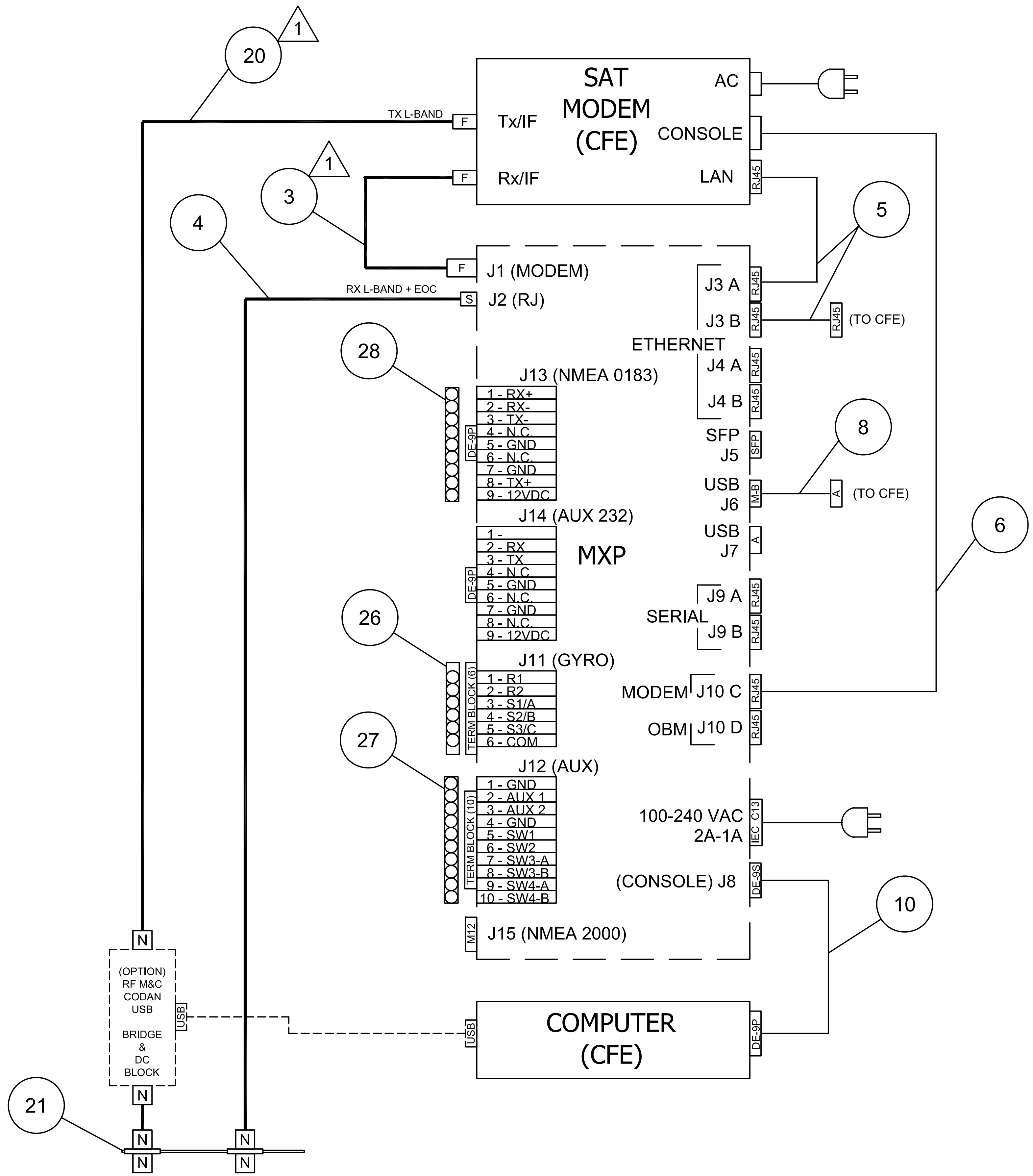
BELOW DECK KIT, 4012GX (MXP)

PROD FAMILY	EFF. DATE		DRAWING NUMBER	REV
COMMON	5/3/2012	SHT 1 OF 2	134563-1	A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	9456	03-30-12	RELEASE TO PRODUCTION; REV WAS X6	HT



SHEET	DESCRIPTION
1	iDirect 5000 Series
2	Comtech CDM-570L

REFERENCE DRAWINGS:

134639 SYSTEM BLOCK DIAGRAM,

134640 ANTENNA SYSTEM SCHEMATIC

NOTES UNLESS OTHERWISE SPECIFIED:

1. 75 OHM SATELLITE MODEM CONFIGURATION SHOWN. FOR 50 OHM MODEM CONFIGURATION, REPLACE ITEM 3 WITH ITEM 20 ON THE RX/IF PATH, AND ITEM 20 WITH ITEM 23 (REFER TO BOM) ON THE TX/IF PATH.

REFERENCE DRAWINGS:

134640 ANTENNA SYSTEM SCHEMATIC

131790 ANTENNA PEDESTAL SCHEMATIC, XX09

DRAWN BY: RML
DRAWN DATE: 6/7/2011
APPROVED BY:
APPROVED DATE:

Sea Tel COBHAM
Tel. 925-798-7979 Fax. 925-798-7986

TITLE: BELOW DECK KIT 4012 GX (MXP)

SIZE: B | SCALE: NONE | DRAWING NUMBER: 134563 | REV: A

FIRST USED: 4012

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	134804-1	A	RADOME TOP FAB, 61 IN, TUNED KA/KU, W	
2	1 EA	129419-1	B3	RADOME BASE ASS'Y, 50 IN, SMOOTH, WHI	
52	8 EA	114580-029		WASHER, FLAT, 1/4, S.S.	
53	4 EA	114586-540		SCREW, HEX HD, 1/4-20 x 1-1/4, S.S.	
59	4 EA	119906-029		NUT, NYLON INSERT, 1/4-20	

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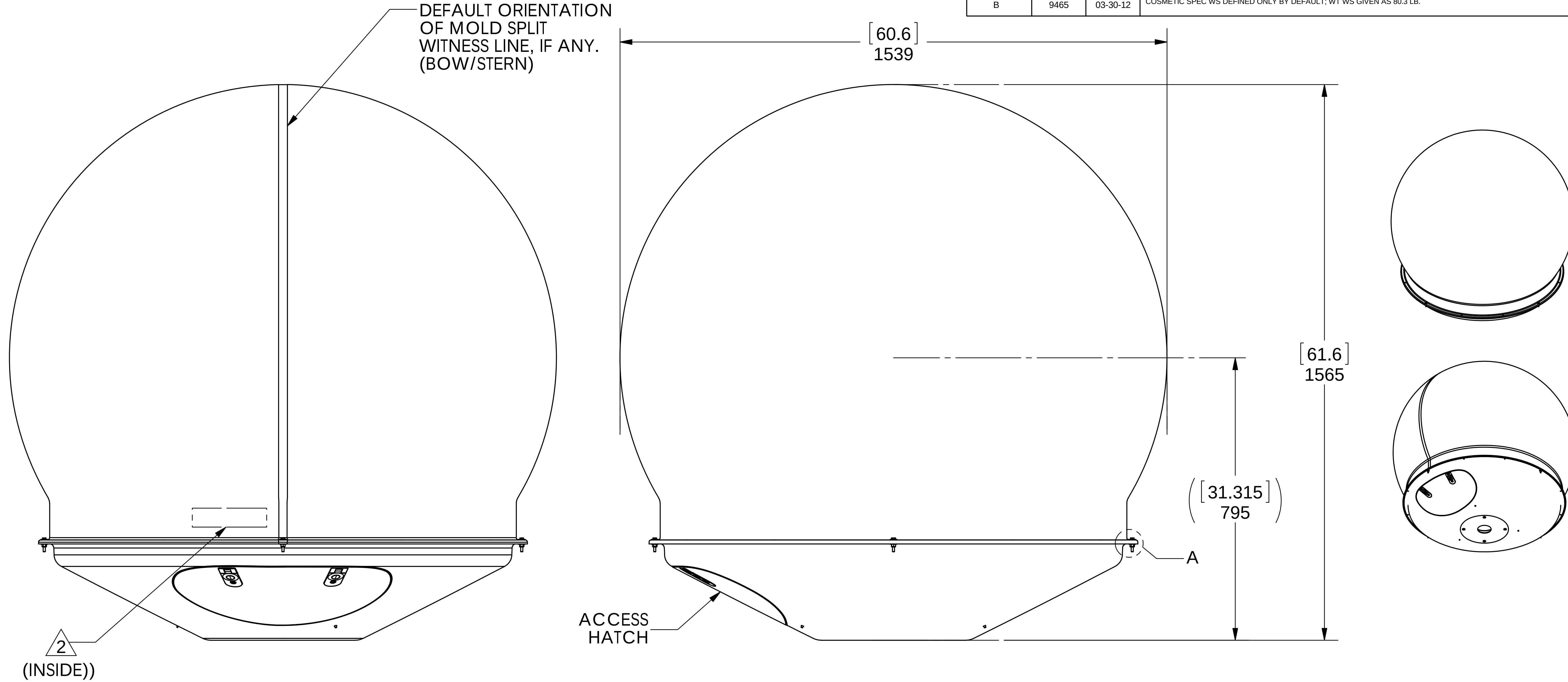
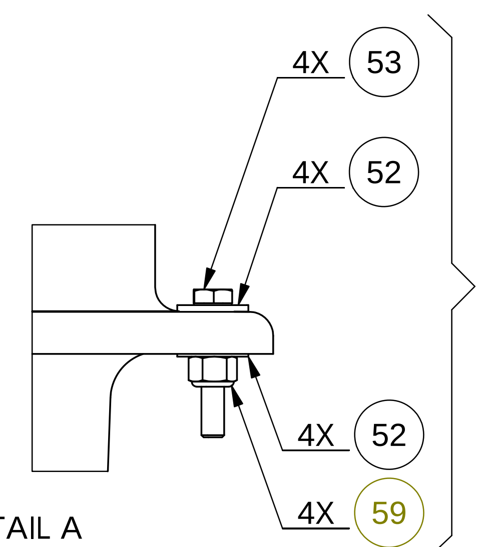
COBHAM

RADOME ASS'Y, 61 IN, TUNED KA/KU, WHITE (4012GX)

PROD FAMILY	EFF. DATE		DRAWING NUMBER	REV
COMMON	5/3/2012	SHT 1 OF 1	134805-1	B

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	9383	02-27-12	RELEASED TO PRODUCTION, REV WS X2	AMN
B	9465	03-30-12	COSMETIC SPEC WS DEFINED ONLY BY DEFAULT; WT WS GIVEN AS 80.3 LB.	AMN





DETAIL A
SCALE 1 : 2

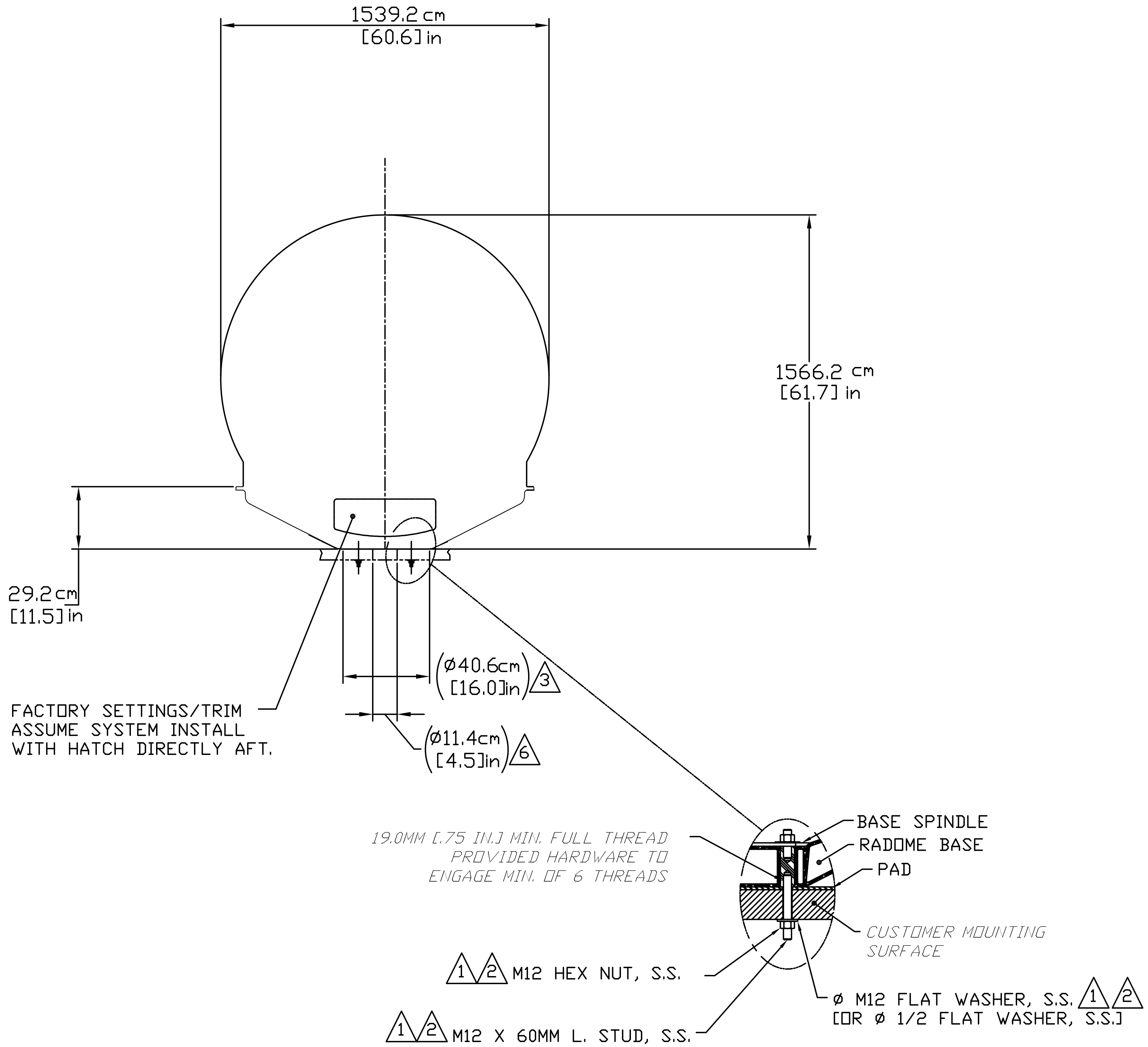
DO NOT APPLY ADHESIVE.
HARDWARE SHOWN
IS FOR TRANSIT ONLY AND
TO BE INSTALLED BY VENDOR
AT 90 DEG. INTERVALS.
DISCARD AT GA INSTALL.

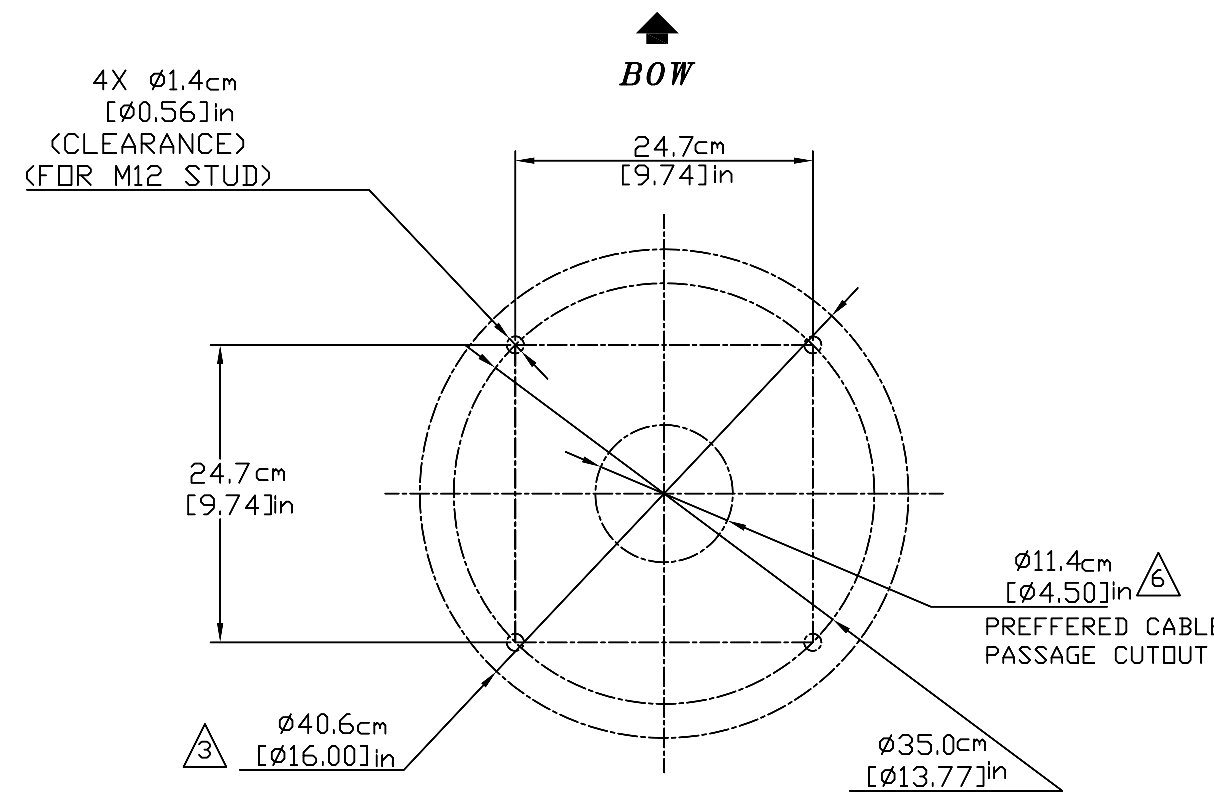
NOTES: UNLESS OTHERWISE SPECIFIED
1. MANUFACTURE PER SEATEL STANDARD 122298.
2. IDENTIFY PER SEA TEL SPECIFICATION 122930 APPROX WHERE SHOWN
3. GENERAL SURFACE AND APPEARANCE STANDARDS PER 127212, CLASS 2B.

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
X.X = ±.050
X.XX = ±.020
X.XXX = ±.005
ANGLES: ±.5°
INTERPRET TOLERANCING PER ASME Y14.5 - 2009

DESIGNER/ENGINEER: AMN	DRAWN BY: AMN	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986
WEIGHT: 115 LB. (MEASURED)	DRAWN DATE: 05-12-11	
MATERIAL: SEE BOM.	APPROVED BY:	TITLE: RADOME ASS'Y, 61 IN, TUNED KA/KU, (HINT)
FINISH: N/A	APPROVED DATE:	
SURFACE ROUGHNESS:	SIZE: B; SCALE: 1:33.3	DRAWING NUMBER: 134805; REV: B
3rd ANGLE PROJECTION	FIRST USED: HINT	SHEET NUMBER: 1 OF 1

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	N/A	04-13-12	RELEASED TO PRODUCTION	AMN





MOUNTING SURFACE PATTERN

NOTES: UNLESS OTHERWISE SPECIFIED

1. INDICATED ITEMS ARE PART OF MOUNTING KIT P/N: 130394.
2. APPLY ADHESIVE PER SEATEL SPEC. 121730. LOCTITE 271 (RED) PROVIDED WITH MOUNTING KIT, P/N 130394.
3. MINIMUM DIAMETER OF MAST MOUNTING PLATE EQUAL TO RADOME BASE DIAMETER.
4. REFER TO DOC. NO. 130040 FOR INSTALLATION GUIDELINES.
5. DIMENSIONS ARE IN CENTIMETERS, [INCHES IN PARENTHESES], TOLERANCE +/- .5MM.
6. ENSURE CABLE PASSAGE CUTOUT EDGES HAVE NO SHARP EDGES, TO PROTECT CABLE.

REFERENCE DRAWINGS
134805 RADOME ASS'Y, 61-IN

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS. X = ±1.50 X.X = ±0.50 X.XX = ±0.15 ANGLES: ±.5° INTERPRET TOLERANCING PER ASME Y14.5M - 1994	DRAWN BY: LW DRAWN DATE: 10-13-11 APPROVED BY: APPROVED DATE:	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986 TITLE: RADOME INSTALLATION ARRANGEMENT, SPHERICAL
MATERIAL: N/A	SIZE: B SCALE: N/A	DRAWING NUMBER: 135874 REV: A
FINISH: N/A	FIRST USED: 4012 GX	SHEET NUMBER: 1 OF 1
3rd ANGLE PROJECTION		

DOCUMENT NO. 124225-4_A

1.0 Purpose. To define the installation procedure for installing strain reliefs in "smooth base" radomes.

2.0 Scope. This installation procedure applies to fiberglass radomes having Sea Tel's standard four-hole mounting pattern, <u>and M12 mounting hardware</u>, in the 80-180 cm (34-66 in) nominal size range, typically referred to as "smooth" base radomes. It also applies to our larger 193 cm (76-inch) radome having a twelve-hole mounting pattern. It is to be used where the preferred center cable exit may not be desired.

3.0 Tools/materials.

1. Electric drill.
2. Small drill bit 1/8" dia. (3-4mm dia.).
3. Hole saw, 1 3/8" dia. (35 mm), with mandrel and ¼" dia. pilot drill.
4. Medium file.
5. Two 1-1/2" (38 mm) adjustable pliers.
6. #2 Phillips screwdriver.
7. Fiberglass resin & catalyst, (marine grade) - at least 2 oz (50 cc).
   Such as Tap Plastics Marine Vinyl Ester Resin with MEKP Catalyst.
   Note: Use liquid resin, instead of paste type, due to better penetration.
8. Mixing cup – 4 oz (100 cc).
9. Disposable brush.
10. Strain Relief Assembly 124903-1, (one per cable).

4.0 Responsibilities. It is the responsibility of the installer to observe all standard safety precautions, including eye, slip, and chemical protection when performing this procedure.

4.1 Procedure.

Remove the standard cable pass through assembly 130818-1*
* N/A for 193 cm (76-inch) nominal size radomes. Refer to Fig 1, then use #2 Phillips screwdriver to remove 4 ea. attachment screws.

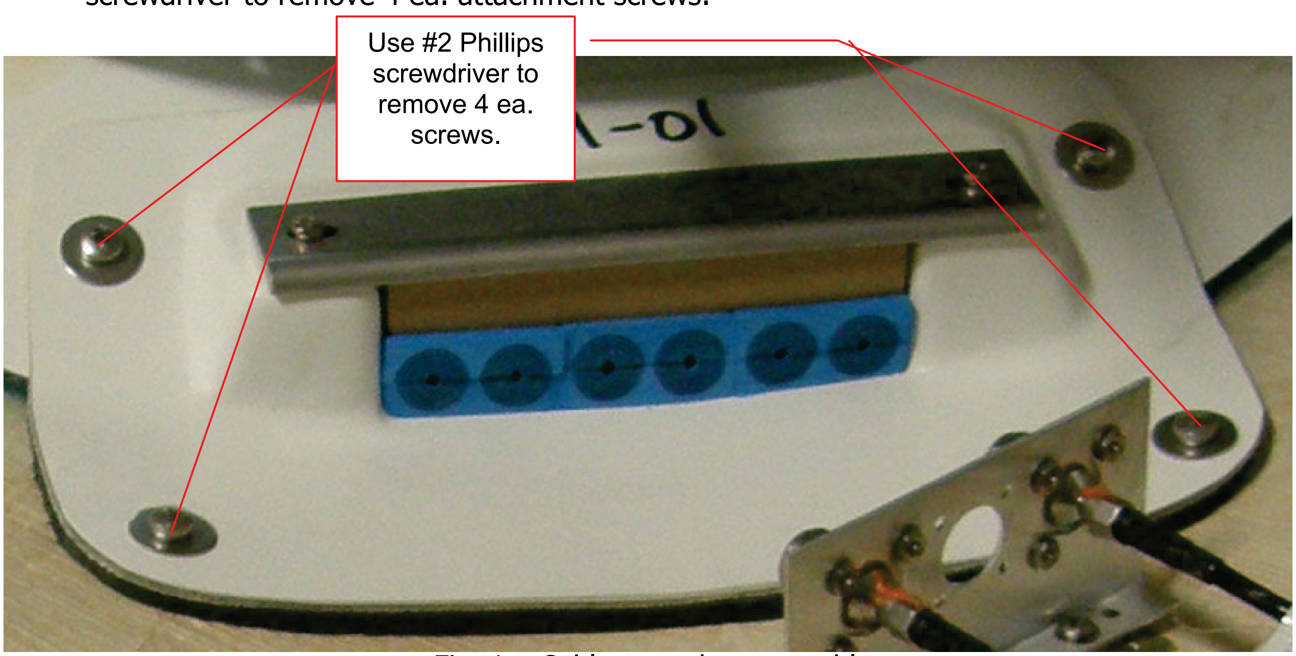


Fig. 1 – Cable pass-thru assembly

4.2 Making the holes

PLANNING: Space has been allowed for up to 5 ea. strain reliefs, but, install only as many as needed. (Typically only 2-3 for TX/RX systems). Refer to Fig 2 then plan which hole positions to use.
For 76-inch radomes lowest holes may be approx 1.5 inches from inside wall corner with floor (ref drawing 129416).
Note: The hole center-to-center distance given is the MINIMUM.

Follow good engineering practice and provide the largest spacing possible between holes as follows:

1 Hole pattern - "A".
2 Hole pattern - "B", "C".
3 Hole pattern - "A", "B", "C", ("A", "D", "E" PERMITTED).
4 Hole pattern - "B", "C", "D", "E".
5 Hole pattern - "A", "B", "C", "D", "E".

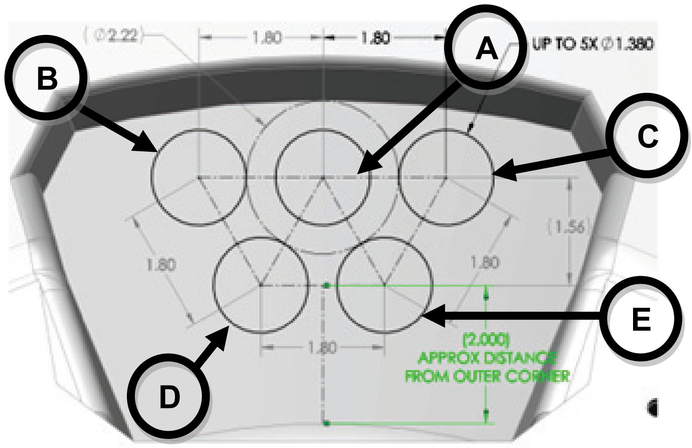


Fig. 2 – Planning
Measure in place or use template drawing 132234

Fig. 3 – (Up to) 5-Hole Pattern

4.3 Measure, mark and drill pilot holes

CAUTION: The hole locations cannot be determined accurately from outside of the radome.
Using full scale drawing 132234, provided in the strain relief kit, measure mark and drill pilot holes from the inside out, and using only light pressure, use the small drill bit, (~1/8" dia) to make a pilot hole through each planned location.

4.4 Use the hole saw from the outside with light pressure.

CAUTION: Using the hole saw from the inside is likely to damage the Gel Coat.

CAUTION: Heavy pressure on the hole saw from the inside is likely to damage the Gel Coat and splinter the fiberglass.

Working from the outside, use a 1-3/8" hole saw to make the holes for the planned strain reliefs.

4.5 After holes are drilled CAREFULLY use a file to clean the hole edges.

4.6 Test fit the strain reliefs in each location, then, make adjustments as necessary.

4.7 Sealing the hole edges.

CAUTION: Cut edges can allow water and/or ice ingress and weaken the fiberglass laminate or structural foam. It is essential to seal all cut edges thoroughly with fiberglass resin to preserve the radome's structural strength.

CAUTION: Fiberglass paste or RTV silicone sealant will not wick into and seal the fiberglass strands as well as fiberglass resin, ONLY use fiberglass resin (such as TAP PLASTICS MARINE VINYL ESTER, or equivalent) for sealing the cut edges.

Follow the manufacturer's instructions to mix a small amount of fiberglass resin and catalyst, then working quickly, use a disposable brush to apply mixed fiberglass resin to the hole edges, both inside and out.

Allow the fiberglass resin to set per resin manufacturer's instructions.

Note: Like all chemical reactions, set time will be temperature/humidity dependent.

4.8 Refer to strain relief assembly drawing 124903

Being careful not to damage either the radome or the strain relief threads, use adjustable pliers to install strain reliefs.

Fig. 4 – Outside view.

Fig. 5 – Outside view.

4.9 Rotate General Assembly (G.A.)

Once cables have been installed, rotate General Assembly (G.A.), to ensure cables are routed properly and do not interfere with azimuth rotation.

Fig. 6 – Inside view.

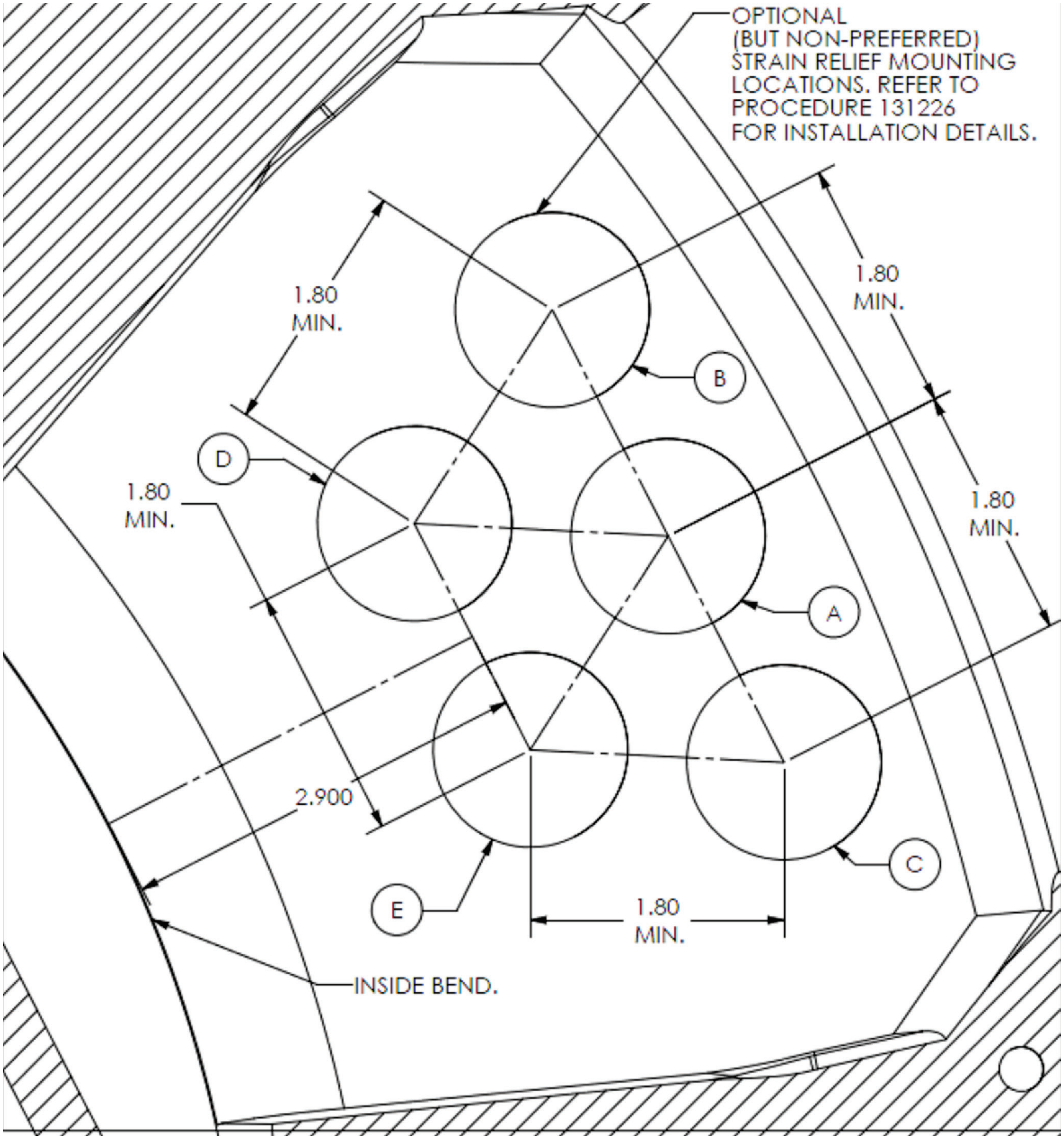
5.0 Records. N/A.

6.0 Training. N/A

7.0 References.

Strain relief assembly drawing (P/N: 124903)
Template drawing (P/N 132234)

8.0 Strain relief positioning for 80-180 cm (34-66 in) smooth based radomes, (May use Sea Tel drawing 132234 as template.)



9.0 Strain relief positioning for 193 cm (76-inch) radomes. (May use Sea Tel drawing 132234 as template.)